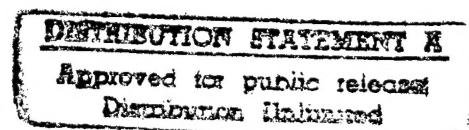


Limited Energy Study  
Energy Engineering Analysis Program (EEAP)  
Fort Knox, Kentucky

*Final Report*

*Volume 2*  
*Sections 3 (continued) - 7*

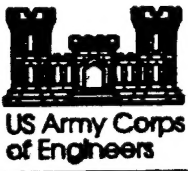
CONTRACT # DACA27-83-C-0096  
SYSTEMS/CORP PROJECT # 93006.03  
NOVEMBER 5, 1993



**SYSTEMS***corp*

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SYSTEMS ENGINEERING AND MANAGEMENT CORPORATION





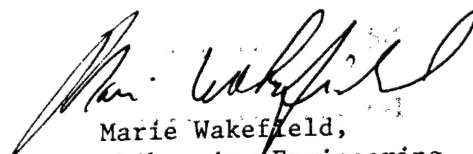


DEPARTMENT OF THE ARMY  
CONSTRUCTION ENGINEERING RESEARCH LABORATORIES, CORPS OF ENGINEERS  
P.O. BOX 9005  
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Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2963

TIME 15:13:33

CONTRACTOR DIRECT SUMMARY

SUMMARY PAGE 4

ID	CONTRACTOR	PM	QUANTITY	UOM	MANHRS	LABOR	EQUIPMENT	MAT W/TX	AMOUNT	PCT	W/OH&P	SUBTOTAL
AA	GENERAL/PRIME		1.00	EA	11	361	2	1,735	2,098	100.0%	0	2,098
	TOTAL DIRECT				11	361	2	1,735	2,098	100.0%		

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 296331

3-340



Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS H-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2963

TIME 15:13:33

CONTRACTOR INDIRECT SUMMARY

SUMMARY PAGE 5

-----			*** OVERHEAD ***			-----			**** PROFIT ****			-----			***** TOTAL CONTRACT *****		
ID	CONTRACTOR	PM	SUBTOTAL	AMOUNT	PCT	HOFC%	AMOUNT	PCT	BOND%	OTHR%	AMOUNT	PCT	UNIT	COST			
AA	GENERAL/PRIME		2,098	210	10.0%	0.0	173	7.5%	2.5%	0.0%	2,543	100.0%	2542.73				
				-----			-----										
				210	10.0%		173	7.5%									
			TOTAL OVERHEAD & PROFIT														

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 296331

3-341



Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2963

TIME 15:13:33

CSI DIVISION SUMMARY

SUMMARY PAGE 6

ID CSI DIVISION	MANHOURS	LABOR	EQUIPMENT	MATERIAL	SALES TAX	***** TOTAL * DIRECT
16 ELECTRICAL	11	361	2	1,652	83	2,098
TOTAL DIRECT	11	361	2	1,652	83	2,098

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 296331

3-342



Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2963

TIME 15:13:33

SYSTEMS SUMMARY

SUMMARY PAGE 7

ID SYSTEM	MANHOURS	LABOR	EQUIPMENT	MATERIAL	SALES TAX	***** TOTAL * DIRECT
11 INTERIOR ELECTRICAL	11	361	2	1,652	83	2,098
TOTAL DIRECT	11	361	2	1,652	83	2,098

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 296331

3-343



Fri 17 Sep 1993

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LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2963

TIME 15:13:33

EQUIPMENT SUMMARY

SUMMARY PAGE 8

----- *** BOOK VALUE *** ADJ FACTOR ADJUSTD BOOK OP -- HRLY --- UPB **** TOTAL ****											
EQUIP DESCRIPTION	LIFE HRS	TL	HRLY	OWNRSH	OWNS	OVTM	OWNRSH	EXPENSE	RATE	RATE	HOURS COST
-----											
EMI20 SMALL TOOLS									1.40	1.40	1 2
TOTAL PROJECT EQUIPMENT HOURS											1 2

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 296331

3-344



Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2963

TIME 15:13:33

LABOR SUMMARY

SUMMARY PAGE 9

CRAFT DESCRIPTION	BASE	OVERTM	TXS/INS	FRNG	TRVL	HRLY RATE	UPB RATE	**** HOURS	TOTAL COST
LELEC ELECTRICIANS	20.50	0.0%	24.0%	7.49	0.00	32.91	25.79	11	361
TOTAL PROJECT MANHOURS								11	361

\*\*\* END OF SUMMARY REPORT \*\*\*

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 296331

3-345



# FORT KNOX LIMITED ENERGY STUDY

ECO 3.1: INSTALL PHOTOCELL LIGHTING CONTROLS TO REDUCE LIGHT LEVELS WHEN POSSIBLE  
30 SEPTEMBER 1993

## FACILITY LIGHTING CONTROL INSTALLATION - ON/OFF PHOTOCELLS

BUILDING #: 2969  
BUILDING FUNCTION: TANK REPAIR SHOP  
EXISTING FIXTURE DATA:  
LAMP TYPE METAL HALIDE  
FIXTURE WATTAGE 455 WATTS  
NUMBER OF FIXTURES 18

BUILDING USE:  
HOURS/DAY 8  
DAYS/WEEK 5

ELECTRIC COSTS:  
ENERGY CHARGE \$0.02506 PER KWH  
DEMAND CHARGE \$7.067 PER KW

### EXISTING LIGHTING CONTROL DATA

0 FIXTS. @ 0.455 KW @ 0% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.455 KW @ 10% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.455 KW @ 20% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.455 KW @ 40% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.455 KW @ 60% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.455 KW @ 80% OUTPUT \* 0 HR/YR = 0 KWH/YR  
18 FIXTS. @ 0.455 KW @ 100% OUTPUT \* 2,080 HR/YR = 17,035 KWH/YR

TOTAL EXISTING KWH 17,035

### REVISED LIGHTING CONTROL DATA

12 FIXTS. @ 0.455 KW @ 0% OUTPUT \* 920 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.455 KW @ 10% OUTPUT \* HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.455 KW @ 20% OUTPUT \* HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.455 KW @ 40% OUTPUT \* HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.455 KW @ 60% OUTPUT \* HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.455 KW @ 80% OUTPUT \* HR/YR = 0 KWH/YR  
12 FIXTS. @ 0.455 KW @ 100% OUTPUT \* 1,160 HR/YR = 6,334 KWH/YR  
6 FIXTS. @ 0.455 KW @ 100% OUTPUT \* 2,080 HR/YR = 5,978 KWH/YR

TOTAL REVISED CONTROL KWH 12,012

NET ENERGY SAVINGS

17.14 MBTU/YR

NET DOLLAR SAVINGS

\$357 /YR



Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES

TIME 15:22:56

TITLE PAGE

---

LIMITED ENERGY STUDY  
FT KNOX, KY  
ECO-3.1: BUILDING 2969

Contract No: 27-93-C-0096

Prepared By: Systems Corp  
Estimator: Julie A. Hollensbe  
Estimate Prep. Date: 09/30/93

Current UPB/CSI ID: ORL290

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CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 296931

3-347



Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2969

TIME 15:22:56

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DETAILED ESTIMATE

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Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2969

TIME 15:22:56

DETAILED ESTIMATE

DETAIL PAGE 1

1. BUILDING TO THE 5 FOOT LINE / AA. ELECTRICAL

BASE BID

DIVISION 16 ELECTRICAL	QUANTITY	UOM	CREW	MANHR	LABOR	EQUIPMENT	MATERIAL	SALESTX	DIRECT \$
16050 BASIC MATERIALS AND METHODS									
16120 1100 SINGLE SOLID CONDUCTOR.									
CD=4 EL 1102 NO. 12 AWG - TYPE THW INSULATION *** UNIT COSTS: ***	7.14			215.37	0.97	72.72	3.64	292.69	
WC=1100 0.72 MLF EELEF	5			155	1	52	3	211	
16900 CONTROLS AND INSTRUMENTATION									
16930 2000 PHOTO-CELL, RELAY, LIGHTING ARRESTER, RECEPTACLE AND BRACKET									
CD=3 EL 2003 PHOTOCCELL FOR ON/OFF CONTROL *** UNIT COSTS: ***	0.63			20.63	0.08	600.00	30.00	650.71	
WC=1100 BASED ON FOOTCANDLE READING 2.00 EA EELEB	1			41	0	1,200	60	1,301	
CD=3 EL 2004 CIRCUIT FOR CONTROL PANEL FOR *** UNIT COSTS: ***	1.25			41.26	0.16	100.00	5.00	146.42	
WC=1100 ON/OFF PHOTOCCELL CONTROL 4.00 EA EELEB	5			165	1	400	20	586	
TOTAL DIVISION 16 ELECTRICAL	11			361	2	1,652	83	2,098	
TOTAL FACILITY AA. ELECTRICAL	11			361	2	1,652	83	2,098	
TOTAL BID ITEM 1. BUILDING TO THE 5 FOOT LINE	11			361	2	1,652	83	2,098	
TOTAL BASE BID	11			361	2	1,652	83	2,098	
TOTAL ADDITIVE	0			0	0	0	0	0	0
TOTAL INCL ADD LIMITED ENERGY STUDY	11			361	2	1,652	83	2,098	

\*\*\* END OF DETAIL REPORT \*\*\*

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 296931

3-349



Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2969

TIME 15:22:56

PROJECT NOTES

SUMMARY PAGE 1

---

PROJECT NOTES

ECO-3: FACILITY LIGHTING CONTROLS

SCOPE OF WORK: EVALUATE USE OF LIGHTING CONTROLS TO SAVE ENERGY IN  
SELECTED FACILITIES AT FT KNOX.

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 296931

3-350



Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
 LIMITED ENERGY STUDY / FT KNOX, KY  
 ECO-3.1: BUILDING 2969

TIME 15:22:56

BID ITEM AND FACILITY SUMMARY

SUMMARY PAGE 2

BID ITEM 1 BUILDING TO THE 5 FOOT LINE

BASE BID

ID	FACILITY		COST TO PRM	OVERHEAD	HOME OFC	PROFIT	BOND	OTHR FCTR	TOTAL COST	UNIT COST
AA	ELECTRICAL	1.00 EA	2,098	10.0% 210	0.0% 0	7.5% 173	2.5% 62	0.0% 0	2,543	2542.73
BID ITEM TOTAL		1.00 EA	2,098	210	0	173	62	0	2,543	2542.73
TOTAL BASE BID			2,098	210	0	173	62	0	2,543	
TOTAL ADDITIVE			0	0	0	0	0	0	0	
TOTAL INCL ADD			2,098	210	0	173	62	0	2,543	

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 296931

3-351



Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
 LIMITED ENERGY STUDY / FT KNOX, KY  
 ECO-3.1: BUILDING 2969

TIME 15:22:56

PROJECT CWE SUMMARY

SUMMARY PAGE 3

ID	BID ITEM	QUANTITY UOM	BASE BID	ADDITIVE	TOTAL COST	UNIT COST
	1. BUILDING TO THE 5 FOOT LINE	1.00 EA	2,543		2,543	2542.70
	TOTAL CURRENT CONTRACT COST		2,543	0	2,543	
	Cost Growth from 09/93 to 09/94 Index Values: 0000 0000	0.0%	0	0	0	
	ESCALATED CONTRACT COST		2,543	0	2,543	
	Government-Furnished Property		0		0	
	SUBTOTAL		2,543	0	2,543	
	Contingencies	10.0%	254	0	254	
	SUBTOTAL		2,797	0	2,797	
	SIOH (S&A)	5.0%	140	0	140	
	CURRENT WORKING ESTIMATE		2,937	0	2,937	
	Estimated Construction Time	365 Days				

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 296931

3-352



Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2969

TIME 15:22:56

CONTRACTOR DIRECT SUMMARY

SUMMARY PAGE 4

ID	CONTRACTOR	PH	QUANTITY	UOM	MANHRS	LABOR	EQUIPMENT	MAT	W/TX	AMOUNT	PCT	W/OH&P	SUBTOTAL
AA	GENERAL/PRIME		1.00	EA	11	361	2	1,735		2,098	100.0%	0	2,098
	TOTAL DIRECT				11	361	2	1,735		2,098	100.0%		

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 296931

3-353



### CONTRACTOR INDIRECT SUMMARY

SUMMARY PAGE 5

-----				*** OVERHEAD ***		-----		**** PROFIT ****		-----		***** TOTAL CONTRACT *****		
ID	CONTRACTOR	PM	SUBTOTAL	AMOUNT	PCT	HOFC%	AMOUNT	PCT	BOND%	OTHER%	AMOUNT	PCT	UNIT	COST
-----														
AA	GENERAL/PRIME		2,098	210	10.0%	0.0	173	7.5%	2.5%	0.0%	2,543	100.0%	2542.73	
				-----	-----		-----	-----						
TOTAL OVERHEAD & PROFIT				210	10.0%		173	7.5%						



Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2969

TIME 15:22:56

CSI DIVISION SUMMARY

SUMMARY PAGE 6

ID CSI DIVISION	MANHOURS	LABOR	EQUIPMENT	MATERIAL	SALES TAX	***** TOTAL * DIRECT
16 ELECTRICAL	11	361	2	1,652	83	2,098
TOTAL DIRECT	11	361	2	1,652	83	2,098

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 296931

3-355



Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2969

TIME 15:22:56

SYSTEMS SUMMARY

SUMMARY PAGE 7

ID SYSTEM	MANHOURS	LABOR	EQUIPMENT	MATERIAL	SALES TAX	***** TOTAL * DIRECT
11 INTERIOR ELECTRICAL	11	361	2	1,652	83	2,098
TOTAL DIRECT	11	361	2	1,652	83	2,098

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 296931

3-356



Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2969

TIME 15:22:56

EQUIPMENT SUMMARY

SUMMARY PAGE 8

----- *** BOOK VALUE *** ADJ FACTOR ADJUSTD BOOK OP -- HRLY --- UPB **** TOTAL ****											
EQUIP DESCRIPTION	LIFE HRS	TL HRLY	OWNRSH	OWNS	OVTM	OWNRSH	EXPENSE	RATE	RATE	HOURS	COST
EMI20 SMALL TOOLS								1.40	1.40	1	2
										-----	-----
TOTAL PROJECT EQUIPMENT HOURS										1	2

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 296931

3-357



Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2969

TIME 15:22:56

LABOR SUMMARY

SUMMARY PAGE 9

CRAFT DESCRIPTION	BASE	OVERTM	TXS/INS	FRNG	TRVL	HRLY RATE	UPB RATE	**** HOURS	TOTAL COST
LELEC ELECTRICIANS	20.50	0.0%	24.0%	7.49	0.00	32.91	25.79	11	361
TOTAL PROJECT MANHOURS								11	361

\* \* \* END OF SUMMARY REPORT \* \* \*

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 296931

3-358



# FORT KNOX LIMITED ENERGY STUDY

ECO 3.1: INSTALL PHOTOCELL LIGHTING CONTROLS TO REDUCE LIGHT LEVELS WHEN POSSIBLE  
30 SEPTEMBER 1993

## FACILITY LIGHTING CONTROL INSTALLATION - ON/OFF PHOTOCELLS

BUILDING #: 2970  
BUILDING FUNCTION: TANK REPAIR SHOP

BUILDING USE:  
HOURS/DAY 8  
DAYS/WEEK 5

### EXISTING FIXTURE DATA:

LAMP TYPE METAL HALIDE  
FIXTURE WATTAGE 455 WATTS  
NUMBER OF FIXTURES 18

ELECTRIC COSTS:  
ENERGY CHARGE \$0.02506 PER KWH  
DEMAND CHARGE \$7.067 PER KW

### EXISTING LIGHTING CONTROL DATA

0 FIXTS. @ 0.455 KW @ 0% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.455 KW @ 10% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.455 KW @ 20% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.455 KW @ 40% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.455 KW @ 60% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.455 KW @ 80% OUTPUT \* 0 HR/YR = 0 KWH/YR  
18 FIXTS. @ 0.455 KW @ 100% OUTPUT \* 2,080 HR/YR = 17,035 KWH/YR

TOTAL EXISTING KWH

17,035

### REVISED LIGHTING CONTROL DATA

12 FIXTS. @ 0.455 KW @ 0% OUTPUT \* 920 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.455 KW @ 10% OUTPUT \* HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.455 KW @ 20% OUTPUT \* HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.455 KW @ 40% OUTPUT \* HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.455 KW @ 60% OUTPUT \* HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.455 KW @ 80% OUTPUT \* HR/YR = 0 KWH/YR  
12 FIXTS. @ 0.455 KW @ 100% OUTPUT \* 1,160 HR/YR = 6,334 KWH/YR  
6 FIXTS. @ 0.455 KW @ 100% OUTPUT \* 2,080 HR/YR = 5,978 KWH/YR

TOTAL REVISED CONTROL KWH

12,012

NET ENERGY SAVINGS

17.14 MBTU/YR

NET DOLLAR SAVINGS

\$357 /YR



Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES

TIME 15:31:45

TITLE PAGE

---

LIMITED ENERGY STUDY  
FT KNOX, KY  
ECO-3.1: BUILDING 2970

Contract No: 27-93-C-0096

Prepared By: Systems Corp  
Estimator: Julie A. Hollensbe  
Estimate Prep. Date: 09/30/93  
Current UPB/CSI ID: ORL290

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REW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 297031

3-360



Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2970

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\* \* \* END TABLE OF CONTENTS \* \* \*



Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2970

TIME 15:31:45

DETAILED ESTIMATE

DETAIL PAGE 1

1. BUILDING TO THE 5 FOOT LINE / AA. ELECTRICAL

BASE BID

DIVISION 16 ELECTRICAL		QUANTITY	UOM	CREW	MANHR	LABOR	EQUIPMENT	MATERIAL	SALESTX	DIRECT \$
16050 BASIC MATERIALS AND METHODS										
16120 1100 SINGLE SOLID CONDUCTOR.										
CD=4 EL 1102	NO. 12 AWG - TYPE THW INSULATION *** UNIT COSTS: ***	7.14				215.37	0.97	72.72	3.64	292.69
WC=1100	0.72 MLF EELEF	5				155	1	52	3	211
16900 CONTROLS AND INSTRUMENTATION										
16930 2000 PHOTO-CELL, RELAY, LIGHTING ARRESTER, RECEPTACLE AND BRACKET										
CD=3 EL 2003	PHOTOCELL FOR ON/OFF CONTROL *** UNIT COSTS: ***	0.63				20.63	0.08	600.00	30.00	650.71
WC=1100	BASED ON FOOTCANDLE READING 2.00 EA EELEB	1				41	0	1,200	60	1,301
CD=3 EL 2004	CIRCUIT FOR CONTROL PANEL FOR *** UNIT COSTS: ***	1.25				41.26	0.16	100.00	5.00	146.42
WC=1100	ON/OFF PHOTOCELL CONTROL 4.00 EA EELEB	5				165	1	400	20	586
TOTAL DIVISION 16 ELECTRICAL		11				361	2	1,652	83	2,098
TOTAL FACILITY AA. ELECTRICAL		11				361	2	1,652	83	2,098
TOTAL BID ITEM 1. BUILDING TO THE 5 FOOT LINE		11				361	2	1,652	83	2,098
TOTAL BASE BID		11				361	2	1,652	83	2,098
TOTAL ADDITIVE		0				0	0	0	0	0
TOTAL INCL ADD LIMITED ENERGY STUDY		11				361	2	1,652	83	2,098

\*\*\* END OF DETAIL REPORT \*\*\*

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 297031

3-362



Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2970

TIME 15:31:45

PROJECT NOTES

SUMMARY PAGE 1

---

PROJECT NOTES

ECO-3: FACILITY LIGHTING CONTROLS

SCOPE OF WORK: EVALUATE USE OF LIGHTING CONTROLS TO SAVE ENERGY IN  
SELECTED FACILITIES AT FT KNOX.

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 297031

3-363



Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2970

TIME 15:31:45

BID ITEM AND FACILITY SUMMARY

SUMMARY PAGE 2

BID ITEM 1 BUILDING TO THE 5 FOOT LINE

BASE BID

ID	FACILITY	COST TO PRM	OVERHEAD	HOME OFC	PROFIT	BOND	OTHR	FCTR	TOTAL COST	UNIT COST
AA	ELECTRICAL	1.00 EA	2,098	10.0% 210	0.0% 0	7.5% 173	2.5% 62	0.0% 0	2,543	2542.73
BID ITEM TOTAL		1.00 EA	2,098	210	0	173	62	0	2,543	2542.73
TOTAL BASE BID			2,098	210	0	173	62	0	2,543	
TOTAL ADDITIVE			0	0	0	0	0	0	0	
TOTAL INCL ADD			2,098	210	0	173	62	0	2,543	

REW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 297031

3-364



Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
 LIMITED ENERGY STUDY / FT KNOX, KY  
 ECO-3.1: BUILDING 2970

TIME 15:31:45

PROJECT CWE SUMMARY

SUMMARY PAGE 3

ID	BID ITEM	QUANTITY UOM	BASE BID	ADDITIVE	TOTAL COST	UNIT COST
	1. BUILDING TO THE 5 FOOT LINE	1.00 EA	2,543		2,543	2542.70
	TOTAL CURRENT CONTRACT COST		2,543	0	2,543	
	Cost Growth from 09/93 to 09/94 Index Values: 0000 0000	0.0%	0	0	0	
	ESCALATED CONTRACT COST		2,543	0	2,543	
	Government-Furnished Property		0		0	
	SUBTOTAL		2,543	0	2,543	
	Contingencies	10.0%	254	0	254	
	SUBTOTAL		2,797	0	2,797	
	SIOH (S&A)	5.0%	140	0	140	
	CURRENT WORKING ESTIMATE		2,937	0	2,937	
	Estimated Construction Time	365 Days				

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 297031

3-365



Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2970

TIME 15:31:45

CONTRACTOR DIRECT SUMMARY

SUMMARY PAGE 4

ID	CONTRACTOR	PM	QUANTITY	UOM	MANHRS	LABOR	EQUIPMENT	MAT W/TX	** TOTAL DIRECT **	AMOUNT	PCT	** SUBCON **	W/OH&P	SUBTOTAL
AA	GENERAL/PRIME		1.00	EA	11	361	2	1,735	2,098	100.0%		0		2,098
	TOTAL DIRECT				11	361	2	1,735	2,098	100.0%				

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 297031

3-366



Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2970

TIME 15:31:45

CONTRACTOR INDIRECT SUMMARY

SUMMARY PAGE 5

ID	CONTRACTOR	PM	SUBTOTAL	*** OVERHEAD *** AMOUNT	PCT	HOFC%	**** PROFIT **** AMOUNT	PCT	BOND%	OTHR%	***** TOTAL CONTRACT ***** AMOUNT	PCT	UNIT COST
AA	GENERAL/PRIME		2,098	210	10.0%	0.0	173	7.5%	2.5%	0.0%	2,543	100.0%	2542.73
	TOTAL OVERHEAD & PROFIT			210	10.0%		173	7.5%					

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 297031

3-367



Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2970

TIME 15:31:45

CSI DIVISION SUMMARY

SUMMARY PAGE 6

ID CSI DIVISION	MANHOURS	LABOR	EQUIPMENT	MATERIAL	SALES TAX	***** TOTAL * DIRECT
16 ELECTRICAL	11	361	2	1,652	83	2,098
TOTAL DIRECT	11	361	2	1,652	83	2,098

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 297031

3-368



Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2970

TIME 15:31:45

SYSTEMS SUMMARY

SUMMARY PAGE 7

ID SYSTEM	MANHOURS	LABOR	EQUIPMENT	MATERIAL	SALES TAX	***** TOTAL * DIRECT
11 INTERIOR ELECTRICAL	11	361	2	1,652	83	2,098
TOTAL DIRECT	11	361	2	1,652	83	2,098

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 297031

3-369



Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2970

TIME 15:31:45

EQUIPMENT SUMMARY

SUMMARY PAGE 8

EQUIP DESCRIPTION	LIFE HRS	TL HRLY	OWNRSH	OWNS	OVTM	OWNRSH	EXPENSE	HRLY RATE	UPB RATE	HOURS	TOTAL COST
ENI20 SMALL TOOLS								1.40	1.40	1	2
TOTAL PROJECT EQUIPMENT HOURS										1	2

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 297031

3-370



Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2970

TIME 15:31:45

LABOR SUMMARY

SUMMARY PAGE 9

CRAFT DESCRIPTION	BASE	OVERTM	TXS/INS	FRNG	TRVL	HRLY -- RATE	UPB RATE	**** TOTAL **** HOURS	COST
LELEC ELECTRICIANS	20.50	0.0%	24.0%	7.49	0.00	32.91	25.79	11	361
TOTAL PROJECT MANHOURS								11	361

\*\*\* END OF SUMMARY REPORT \*\*\*

CREW ID: ORE290

CURRENCY in DOLLARS

PROJECT ID: 297031

3-371



# FORT KNOX LIMITED ENERGY STUDY

ECO 3.1: INSTALL PHOTOCELL LIGHTING CONTROLS TO REDUCE LIGHT LEVELS WHEN POSSIBLE

30 SEPTEMBER 1993

## FACILITY LIGHTING CONTROL INSTALLATION - ON/OFF PHOTOCELLS

BUILDING #: 2971

BUILDING FUNCTION: TANK REPAIR SHOP

BUILDING USE:

HOURS/DAY 8

DAYS/WEEK 5

### EXISTING FIXTURE DATA:

LAMP TYPE METAL HALIDE

FIXTURE WATTAGE 455 WATTS

NUMBER OF FIXTURES 18

### ELECTRIC COSTS:

ENERGY CHARGE \$0.02506 PER KWH

DEMAND CHARGE \$7.067 PER KW

### EXISTING LIGHTING CONTROL DATA

0 FIXTS. @ 0.455 KW @ 0% OUTPUT \* 0 HR/YR = 0 KWH/YR

0 FIXTS. @ 0.455 KW @ 10% OUTPUT \* 0 HR/YR = 0 KWH/YR

0 FIXTS. @ 0.455 KW @ 20% OUTPUT \* 0 HR/YR = 0 KWH/YR

0 FIXTS. @ 0.455 KW @ 40% OUTPUT \* 0 HR/YR = 0 KWH/YR

0 FIXTS. @ 0.455 KW @ 60% OUTPUT \* 0 HR/YR = 0 KWH/YR

0 FIXTS. @ 0.455 KW @ 80% OUTPUT \* 0 HR/YR = 0 KWH/YR

18 FIXTS. @ 0.455 KW @ 100% OUTPUT \* 2,080 HR/YR = 17,035 KWH/YR

TOTAL EXISTING KWH

17,035

### REVISED LIGHTING CONTROL DATA

12 FIXTS. @ 0.455 KW @ 0% OUTPUT \* 920 HR/YR = 0 KWH/YR

0 FIXTS. @ 0.455 KW @ 10% OUTPUT \* HR/YR = 0 KWH/YR

0 FIXTS. @ 0.455 KW @ 20% OUTPUT \* HR/YR = 0 KWH/YR

0 FIXTS. @ 0.455 KW @ 40% OUTPUT \* HR/YR = 0 KWH/YR

0 FIXTS. @ 0.455 KW @ 60% OUTPUT \* HR/YR = 0 KWH/YR

0 FIXTS. @ 0.455 KW @ 80% OUTPUT \* HR/YR = 0 KWH/YR

12 FIXTS. @ 0.455 KW @ 100% OUTPUT \* 1,160 HR/YR = 6,334 KWH/YR

6 FIXTS. @ 0.455 KW @ 100% OUTPUT \* 2,080 HR/YR = 5,978 KWH/YR

TOTAL REVISED CONTROL KWH

12,012

NET ENERGY SAVINGS

17.14 MBTU/YR

NET DOLLAR SAVINGS

\$357 /YR



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES

TIME 08:01:08

TITLE PAGE

---

LIMITED ENERGY STUDY  
FT KNOX, KY  
ECO-3.1: BUILDING 2971

Contract No: 27-93-C-0096

Prepared By: Systems Corp  
Estimator: Julie A. Hollensbe  
Estimate Prep. Date: 09/30/93

Current UPB/CSI ID: ORL290

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CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 297131

3-373



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2971

TIME 08:01:08

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Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
 LIMITED ENERGY STUDY / FT KNOX, KY  
 ECO-3.1: BUILDING 2971  
 1. BUILDING TO THE 5 FOOT LINE / AA. ELECTRICAL

TIME 08:01:08

DETAILED ESTIMATE

DETAIL PAGE 1

BASE BID

DIVISION 16 ELECTRICAL		QUANTITY	UOM	CREW	MANHR	LABOR	EQUIPMENT	MATERIAL	SALESTX	DIRECT \$
16050 BASIC MATERIALS AND METHODS										
16120 1100 SINGLE SOLID CONDUCTOR.										
CD=4 EL 1102	NO. 12 AWG - TYPE THW INSULATION ***	UNIT COSTS: ***			7.14	215.37	0.97	72.72	3.64	292.69
WC=1100		0.72 MLF EELEF		5		155	1	52	3	211
16900 CONTROLS AND INSTRUMENTATION										
16930 2000 PHOTO-CELL, RELAY, LIGHTING ARRESTER, RECEPTACLE AND BRACKET										
CD=3 EL 2003	PHOTOCELL FOR ON/OFF CONTROL	*** UNIT COSTS: ***			0.63	20.63	0.08	600.00	30.00	650.71
WC=1100	BASED ON FOOTCANDLE READING	2.00 EA EELEB		1		41	0	1,200	60	1,301
CD=3 EL 2004	CIRCUIT FOR CONTROL PANEL FOR	*** UNIT COSTS: ***			1.25	41.26	0.16	100.00	5.00	146.42
WC=1100	ON/OFF PHOTOCELL CONTROL	4.00 EA EELEB		5		165	1	400	20	586
TOTAL DIVISION 16 ELECTRICAL					11	361	2	1,652	83	2,098
TOTAL FACILITY AA. ELECTRICAL					11	361	2	1,652	83	2,098
TOTAL BID ITEM 1. BUILDING TO THE 5 FOOT LINE					11	361	2	1,652	83	2,098
TOTAL BASE BID					11	361	2	1,652	83	2,098
TOTAL ADDITIVE					0	0	0	0	0	0
TOTAL INCL ADD LIMITED ENERGY STUDY					11	361	2	1,652	83	2,098

\*\*\* END OF DETAIL REPORT \*\*\*

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 297131

3-375



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2971

TIME 08:01:08

PROJECT NOTES

SUMMARY PAGE 1

---

PROJECT NOTES

ECO-3: FACILITY LIGHTING CONTROLS

SCOPE OF WORK: EVALUATE USE OF LIGHTING CONTROLS TO SAVE ENERGY IN  
SELECTED FACILITIES AT FT KNOX.

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 297131

3-376



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS H-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2971

TIME 08:01:08

BID ITEM AND FACILITY SUMMARY

SUMMARY PAGE 2

BID ITEM 1 BUILDING TO THE 5 FOOT LINE

BASE BID

ID	FACILITY		COST TO PRM	OVERHEAD	HOME OFC	PROFIT	BOND	OTHR FCTR	TOTAL COST	UNIT COST
AA	ELECTRICAL	1.00 EA	2,098	10.0% 210	0.0% 0	7.5% 173	2.5% 62	0.0% 0	2,543	2542.73
<hr/>										
BID ITEM TOTAL		1.00 EA	2,098	210	0	173	62	0	2,543	2542.73
<hr/>										
TOTAL BASE BID			2,098	210	0	173	62	0	2,543	
TOTAL ADDITIVE			0	0	0	0	0	0	0	
<hr/>										
TOTAL INCL ADD			2,098	210	0	173	62	0	2,543	

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 297131

3-377



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2971

TIME 08:01:08

PROJECT CWE SUMMARY

SUMMARY PAGE 3

ID	BID ITEM	QUANTITY UOM	BASE BID	ADDITIVE	TOTAL COST	UNIT COST
1.	BUILDING TO THE 5 FOOT LINE	1.00 EA	2,543		2,543	2542.70
	TOTAL CURRENT CONTRACT COST		2,543	0	2,543	
	Cost Growth from 09/93 to 09/94 Index Values: 0000 0000	0.0%	0	0	0	
	ESCALATED CONTRACT COST		2,543	0	2,543	
	Government-Furnished Property		0		0	
	SUBTOTAL		2,543	0	2,543	
	Contingencies	10.0%	254	0	254	
	SUBTOTAL		2,797	0	2,797	
	SIOH (S&A)	5.0%	140	0	140	
	CURRENT WORKING ESTIMATE		2,937	0	2,937	

Estimated Construction Time 365 Days

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 297131

3-378



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS H-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2971

TIME 08:01:08

CONTRACTOR DIRECT SUMMARY

SUMMARY PAGE 4

ID	CONTRACTOR	PM	QUANTITY	UOM	MANHRS	LABOR	EQUIPMENT	MAT	W/TX	AMOUNT	PCT	W/OH&P	SUBTOTAL
AA	GENERAL/PRIME		1.00	EA	11	361	2	1,735		2,098	100.0%	0	2,098
	TOTAL DIRECT				11	361	2	1,735		2,098	100.0%		

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 297131

3-379



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2971

TIME 08:01:08

CONTRACTOR INDIRECT SUMMARY

SUMMARY PAGE 5

-----			*** OVERHEAD ***			-----			**** PROFIT ****			-----			***** TOTAL CONTRACT *****		
ID	CONTRACTOR	PM	SUBTOTAL	AMOUNT	PCT	HOFC%	AMOUNT	PCT	BOND%	OTHR%	AMOUNT	PCT	UNIT	COST			
AA	GENERAL/PRIME		2,098	210	10.0%	0.0	173	7.5%	2.5%	0.0%	2,543	100.0%	2542.73				
	TOTAL OVERHEAD & PROFIT			210	10.0%		173	7.5%									

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 297131

3-380



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2971

TIME 08:01:08

CSI DIVISION SUMMARY

SUMMARY PAGE 6

ID CSI DIVISION	MANHOURS	LABOR	EQUIPMENT	MATERIAL	SALES TAX	***** TOTAL * DIRECT
16 ELECTRICAL	11	361	2	1,652	83	2,098
TOTAL DIRECT	11	361	2	1,652	83	2,098

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 297131

3-381



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2971

TIME 08:01:08

SYSTEMS SUMMARY

SUMMARY PAGE 7

ID SYSTEM	MANHOURS	LABOR	EQUIPMENT	MATERIAL	SALES TAX	***** TOTAL * DIRECT
11 INTERIOR ELECTRICAL	11	361	2	1,652	83	2,098
TOTAL DIRECT	11	361	2	1,652	83	2,098

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 297131

3-382



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2971

TIME 08:01:03

EQUIPMENT SUMMARY

SUMMARY PAGE 8

----- *** BOOK VALUE ***		ADJ FACTOR	ADJUSTD	BOOK OP	-- HRLY	---	UPB	**** TOTAL ****						
EQUIP	DESCRIPTION	LIFE HRS	TL HRLY	OWNRSH	OWNS	OVTM	OWNRSH	EXPENSE	RATE	RATE	HOURS	COST		
EMI20	SMALL TOOLS								1.40	1.40	1	2		
											-----	-----		
TOTAL PROJECT EQUIPMENT HOURS													1	2

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 297131

3-383



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2971

TIME 08:01:08

LABOR SUMMARY

SUMMARY PAGE 9

CRAFT DESCRIPTION	BASE	OVERTM	TXS/INS	FRNG	TRVL	HRLY RATE	UPB RATE	**** HOURS	TOTAL COST
LELEC ELECTRICIANS	20.50	0.0%	24.0%	7.49	0.00	32.91	25.79	11	361
TOTAL PROJECT MANHOURS								11	361

\*\*\* END OF SUMMARY REPORT \*\*\*

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 297131

3-384



# FORT KNOX LIMITED ENERGY STUDY

ECO 3.1: INSTALL PHOTOCELL LIGHTING CONTROLS TO REDUCE LIGHT LEVELS WHEN POSSIBLE  
30 SEPTEMBER 1993

## FACILITY LIGHTING CONTROL INSTALLATION - ON/OFF PHOTOCELLS

BUILDING #: 2972  
BUILDING FUNCTION: TANK REPAIR SHOP

BUILDING USE:  
HOURS/DAY 8  
DAYS/WEEK 5

### EXISTING FIXTURE DATA:

LAMP TYPE METAL HALIDE  
FIXTURE WATTAGE 455 WATTS  
NUMBER OF FIXTURES 18

### ELECTRIC COSTS:

ENERGY CHARGE \$0.02506 PER KWH  
DEMAND CHARGE \$7.067 PER KW

### EXISTING LIGHTING CONTROL DATA

0 FIXTS. @ 0.455 KW @ 0% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.455 KW @ 10% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.455 KW @ 20% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.455 KW @ 40% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.455 KW @ 60% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.455 KW @ 80% OUTPUT \* 0 HR/YR = 0 KWH/YR  
18 FIXTS. @ 0.455 KW @ 100% OUTPUT \* 2,080 HR/YR = 17,035 KWH/YR

TOTAL EXISTING KWH 17,035

### REVISED LIGHTING CONTROL DATA

12 FIXTS. @ 0.455 KW @ 0% OUTPUT \* 920 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.455 KW @ 10% OUTPUT \* HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.455 KW @ 20% OUTPUT \* HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.455 KW @ 40% OUTPUT \* HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.455 KW @ 60% OUTPUT \* HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.455 KW @ 80% OUTPUT \* HR/YR = 0 KWH/YR  
12 FIXTS. @ 0.455 KW @ 100% OUTPUT \* 1,160 HR/YR = 6,334 KWH/YR  
6 FIXTS. @ 0.455 KW @ 100% OUTPUT \* 2,080 HR/YR = 5,878 KWH/YR

TOTAL REVISED CONTROL KWH 12,012

NET ENERGY SAVINGS 17.14 MBTU/YR

NET DOLLAR SAVINGS \$357 /YR



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES

TIME 08:09:20

TITLE PAGE

---

LIMITED ENERGY STUDY  
FT KNOX, KY  
ECO-3.1: BUILDING 2972

Contract No: 27-93-C-0096

Prepared By: Systems Corp  
Estimator: Julie A. Hollensbe  
Estimate Prep. Date: 09/30/93

Current UPB/CSI ID: ORL290

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CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 297231

3-386



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2972

TIME 08:09:20

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DETAILED ESTIMATE

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Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
 LIMITED ENERGY STUDY / FT KNOX, KY  
 ECO-3.1: BUILDING 2972  
 1. BUILDING TO THE 5 FOOT LINE / AA. ELECTRICAL

TIME 08:09:20

DETAILED ESTIMATE

DETAIL PAGE 1

BASE BID

DIVISION 16 ELECTRICAL		QUANTITY	UOM	CREW	MANHR	LABOR	EQUIPMENT	MATERIAL	SALESTX	DIRECT \$
16050 BASIC MATERIALS AND METHODS										
16120 1100 SINGLE SOLID CONDUCTOR.										
CD=4 EL 1102	NO. 12 AWG - TYPE THW INSULATION ***	UNIT COSTS: ***		7.14		215.37	0.97	72.72	3.64	292.69
WC=1100		0.72 MLF EELEF		5		155	1	52	3	211
16900 CONTROLS AND INSTRUMENTATION										
16930 2000 PHOTO-CELL, RELAY, LIGHTING ARRESTER, RECEPTACLE AND BRACKET										
CD=3 EL 2003	PHOTOCELL FOR ON/OFF CONTROL	*** UNIT COSTS: ***		0.63		20.63	0.08	600.00	30.00	650.71
WC=1100	BASED ON FOOTCANDLE READING	2.00 EA EELEB		1		41	0	1,200	60	1,301
CD=3 EL 2004	CIRCUIT FOR CONTROL PANEL FOR	*** UNIT COSTS: ***		1.25		41.26	0.16	100.00	5.00	146.42
WC=1100	ON/OFF PHOTOCELL CONTROL	4.00 EA EELEB		5		165	1	400	20	586
TOTAL DIVISION 16 ELECTRICAL				11		361	2	1,652	83	2,098
TOTAL FACILITY AA. ELECTRICAL				11		361	2	1,652	83	2,098
TOTAL BID ITEM 1. BUILDING TO THE 5 FOOT LINE				11		361	2	1,652	83	2,098
TOTAL BASE BID				11		361	2	1,652	83	2,098
TOTAL ADDITIVE				0		0	0	0	0	0
TOTAL INCL ADD LIMITED ENERGY STUDY				11		361	2	1,652	83	2,098

\*\*\* END OF DETAIL REPORT \*\*\*

REW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 297231

3-388



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2972

TIME 08:09:20

PROJECT NOTES

SUMMARY PAGE 1

---

PROJECT NOTES

ECO-3: FACILITY LIGHTING CONTROLS

SCOPE OF WORK: EVALUATE USE OF LIGHTING CONTROLS TO SAVE ENERGY IN  
SELECTED FACILITIES AT FT KNOX.

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 297231

3-389



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2972

TIME 08:09:20

BID ITEM AND FACILITY SUMMARY

SUMMARY PAGE 2

BID ITEM 1 BUILDING TO THE 5 FOOT LINE

BASE BID

ID	FACILITY		COST TO PRM	OVERHEAD	HOME OFC	PROFIT	BOND	OTHR FCTR	TOTAL COST	UNIT COST
AA	ELECTRICAL	1.00 EA	2,098	10.0% 210	0.0% 0	7.5% 173	2.5% 62	0.0% 0	2,543	2542.73
<hr/>										
BID ITEM TOTAL		1.00 EA	2,098	210	0	173	62	0	2,543	2542.73
<hr/>										
TOTAL BASE BID			2,098	210	0	173	62	0	2,543	
TOTAL ADDITIVE			0	0	0	0	0	0	0	
<hr/>										
TOTAL INCL ADD			2,098	210	0	173	62	0	2,543	

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 297231

3-390



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2972

TIME 08:09:20

PROJECT CWE SUMMARY

SUMMARY PAGE 3

ID	BID ITEM	QUANTITY	UOM	BASE BID	ADDITIVE	TOTAL COST	UNIT COST
1.	BUILDING TO THE 5 FOOT LINE	1.00	EA	2,543		2,543	2542.70
TOTAL CURRENT CONTRACT COST				2,543	0	2,543	
Cost Growth from 09/93 to 09/94 Index Values: 0000 0000		0.0%		0	0	0	
ESCALATED CONTRACT COST				2,543	0	2,543	
Government-Furnished Property				0		0	
SUBTOTAL				2,543	0	2,543	
Contingencies		10.0%		254	0	254	
SUBTOTAL				2,797	0	2,797	
SIOH (S&A)		5.0%		140	0	140	
CURRENT WORKING ESTIMATE				2,937	0	2,937	

Estimated Construction Time 365 Days

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 297231

3-391



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2972

TIME 08:09:20

CONTRACTOR DIRECT SUMMARY

SUMMARY PAGE 4

ID	CONTRACTOR	PM	QUANTITY	UOM	MANHRS	LABOR	EQUIPMENT	MAT W/TX	** TOTAL DIRECT ** AMOUNT PCT	** SUBCON ** W/OH&P	SUBTOTAL
AA	GENERAL/PRIME		1.00	EA	11	361	2	1,735	2,098 100.0%	0	2,098
	TOTAL DIRECT				11	361	2	1,735	2,098 100.0%		

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 297231

3-392



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2972

TIME 08:09:20

CONTRACTOR INDIRECT SUMMARY

SUMMARY PAGE 5

ID	CONTRACTOR	PH	SUBTOTAL	*** OVERHEAD *** AMOUNT	PCT	HOFC%	**** PROFIT **** AMOUNT	PCT	BOND%	OTHER%	***** TOTAL CONTRACT ***** AMOUNT	PCT	UNIT COST
AA	GENERAL/PRIME		2,098	210	10.0%	0.0	173	7.5%	2.5%	0.0%	2,543	100.0%	2542.73
	TOTAL OVERHEAD & PROFIT			210	10.0%		173	7.5%					

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 297231

3-393



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2972

TIME 08:09:20

CSI DIVISION SUMMARY

SUMMARY PAGE 6

ID CSI DIVISION	MANHOURS	LABOR	EQUIPMENT	MATERIAL	SALES TAX	***** TOTAL * DIRECT
16 ELECTRICAL	11	361	2	1,652	83	2,098
TOTAL DIRECT	11	361	2	1,652	83	2,098

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 297231

3-394



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2972

TIME 08:09:20

SYSTEMS SUMMARY

SUMMARY PAGE 7

ID SYSTEM	MANHOURS	LABOR	EQUIPMENT	MATERIAL	SALES TAX	***** TOTAL * DIRECT
11 INTERIOR ELECTRICAL	11	361	2	1,652	83	2,098
TOTAL DIRECT	11	361	2	1,652	83	2,098

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 297231

3-395



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2972

TIME 08:09:20

EQUIPMENT SUMMARY

SUMMARY PAGE 8

----- *** BOOK VALUE ***		ADJ FACTOR		ADJUSTD		BOOK OP --		HRLY ---		UPB		**** TOTAL ****	
EQUIP	DESCRIPTION	LIFE HRS	TL HRLY	OWNRSH	OWNS	OVTM	OWNRSH	EXPENSE	RATE	RATE	HOURS	COST	
EMI20	SMALL TOOLS								1.40	1.40	1	2	
											1	2	
TOTAL PROJECT EQUIPMENT HOURS													

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 297231

3-396



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2972

TIME 08:09:20

LABOR SUMMARY

SUMMARY PAGE 9

CRAFT DESCRIPTION	BASE	OVERTM	TXS/INS	FRNG	TRVL	HRLY RATE	UPB RATE	**** HOURS	TOTAL COST
LELEC ELECTRICIANS	20.50	0.0%	24.0%	7.49	0.00	32.91	25.79	11	361
TOTAL PROJECT MANHOURS								11	361

\*\*\* END OF SUMMARY REPORT \*\*\*

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 297231

3-397



# FORT KNOX LIMITED ENERGY STUDY

ECO 3.1: INSTALL PHOTOCELL LIGHTING CONTROLS TO REDUCE LIGHT LEVELS WHEN POSSIBLE  
30 SEPTEMBER 1993

## FACILITY LIGHTING CONTROL INSTALLATION - ON/OFF PHOTOCELLS

BUILDING #: 2973  
BUILDING FUNCTION: TANK REPAIR SHOP

BUILDING USE:  
HOURS/DAY 8  
DAYS/WEEK 5

### EXISTING FIXTURE DATA:

LAMP TYPE METAL HALIDE  
FIXTURE WATTAGE 455 WATTS  
NUMBER OF FIXTURES 18

ELECTRIC COSTS:  
ENERGY CHARGE \$0.02506 PER KWH  
DEMAND CHARGE \$7.067 PER KW

### EXISTING LIGHTING CONTROL DATA

0 FIXTS. @ 0.455 KW @ 0% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.455 KW @ 10% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.455 KW @ 20% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.455 KW @ 40% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.455 KW @ 60% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.455 KW @ 80% OUTPUT \* 0 HR/YR = 0 KWH/YR  
18 FIXTS. @ 0.455 KW @ 100% OUTPUT \* 2,080 HR/YR = 17,035 KWH/YR

TOTAL EXISTING KWH 17,035

### REVISED LIGHTING CONTROL DATA

12 FIXTS. @ 0.455 KW @ 0% OUTPUT \* 920 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.455 KW @ 10% OUTPUT \* HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.455 KW @ 20% OUTPUT \* HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.455 KW @ 40% OUTPUT \* HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.455 KW @ 60% OUTPUT \* HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.455 KW @ 80% OUTPUT \* HR/YR = 0 KWH/YR  
12 FIXTS. @ 0.455 KW @ 100% OUTPUT \* 1,160 HR/YR = 6,334 KWH/YR  
6 FIXTS. @ 0.455 KW @ 100% OUTPUT \* 2,080 HR/YR = 5,678 KWH/YR

TOTAL REVISED CONTROL KWH 12,012

NET ENERGY SAVINGS

17.14 MBTU/YR

NET DOLLAR SAVINGS

\$357 /YR



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES

TIME 08:16:49

TITLE PAGE

---

LIMITED ENERGY STUDY  
FT KNOX, KY  
ECO-3.1: BUILDING 2973

Contract No: 27-93-C-0096

Prepared By: Systems Corp  
Estimator: Julie A. Hollensbe  
Estimate Prep. Date: 09/30/93

Current UPB/CSI ID: ORL290

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Release 4.20

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 297331

3-399



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS H-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2973

TIME 08:16:49

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DETAILED ESTIMATE	DETAIL PAGE
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Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
 LIMITED ENERGY STUDY / FT KNOX, KY  
 ECO-3.1: BUILDING 2973  
 1. BUILDING TO THE 5 FOOT LINE / AA. ELECTRICAL

TIME 08:16:49

DETAILED ESTIMATE

DETAIL PAGE 1

BASE BID

DIVISION 16 ELECTRICAL	QUANTITY	UOM	CREW	MANHR	LABOR	EQUIPMENT	MATERIAL	SALESTY	DIRECT \$
16050 BASIC MATERIALS AND METHODS									
16120 1100 SINGLE SOLID CONDUCTOR.									
CD=4 EL 1102 NO. 12 AWG - TYPE THW INSULATION *** UNIT COSTS: ***	7.14				215.37	0.97	72.72	3.64	292.69
WC=1100 0.72 MLF EELEF	5				155	1	52	3	211
16900 CONTROLS AND INSTRUMENTATION									
16930 2000 PHOTO-CELL, RELAY, LIGHTING ARRESTER, RECEPTACLE AND BRACKET									
CD=3 EL 2003 PHOTOCCELL FOR ON/OFF CONTROL *** UNIT COSTS: ***	0.63				20.63	0.08	600.00	30.00	650.71
WC=1100 BASED ON FOOTCANDLE READING 2.00 EA EELEB	1				41	0	1,200	60	1,301
CD=3 EL 2004 CIRCUIT FOR CONTROL PANEL FOR *** UNIT COSTS: ***	1.25				41.26	0.16	100.00	5.00	146.42
WC=1100 ON/OFF PHOTOCCELL CONTROL 4.00 EA EELEB	5				165	1	400	20	586
TOTAL DIVISION 16 ELECTRICAL	11				361	2	1,652	83	2,098
TOTAL FACILITY AA. ELECTRICAL	11				361	2	1,652	83	2,098
TOTAL BID ITEM 1. BUILDING TO THE 5 FOOT LINE	11				361	2	1,652	83	2,098
TOTAL BASE BID	11				361	2	1,652	83	2,098
TOTAL ADDITIVE	0				0	0	0	0	0
TOTAL INCL ADD LIMITED ENERGY STUDY	11				361	2	1,652	83	2,098

\* \* \* END OF DETAIL REPORT \* \* \*

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 297331

3-401



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2973

TIME 08:16:49

PROJECT NOTES

SUMMARY PAGE 1

---

PROJECT NOTES

ECO-3: FACILITY LIGHTING CONTROLS

SCOPE OF WORK: EVALUATE USE OF LIGHTING CONTROLS TO SAVE ENERGY IN  
SELECTED FACILITIES AT FT KNOX.

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 297331

3-402



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
 LIMITED ENERGY STUDY / FT KNOX, KY  
 ECO-3.1: BUILDING 2973

TIME 08:16:49

BID ITEM AND FACILITY SUMMARY

SUMMARY PAGE 2

BID ITEM 1 BUILDING TO THE 5 FOOT LINE

BASE BID

ID	FACILITY	COST TO PRM	OVERHEAD	HOME OFC	PROFIT	BOND	OTHR FCTR	TOTAL COST	UNIT COST
AA	ELECTRICAL	1.00 EA	2,098	10.0% 210	0.0% 0	7.5% 173	2.5% 62	0.0% 0	2,543 2542.73
BID ITEM TOTAL	1.00 EA	2,098	210	0	173	62	0	2,543	2542.73
TOTAL BASE BID		2,098	210	0	173	62	0	2,543	
TOTAL ADDITIVE		0	0	0	0	0	0	0	
TOTAL INCL ADD		2,098	210	0	173	62	0	2,543	

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 297331

3-403



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2973

TIME 08:16:49

PROJECT CWE SUMMARY

SUMMARY PAGE 3

ID	BID ITEM	QUANTITY	UOM	BASE BID	ADDITIVE	TOTAL COST	UNIT COST
1.	BUILDING TO THE 5 FOOT LINE	1.00	EA	2,543		2,543	2542.70
TOTAL CURRENT CONTRACT COST				2,543	0	2,543	
Cost Growth from 09/93 to 09/94 Index Values: 0000 0000		0.0%		0	0	0	
ESCALATED CONTRACT COST				2,543	0	2,543	
Government-Furnished Property				0		0	
SUBTOTAL				2,543	0	2,543	
Contingencies		10.0%		254	0	254	
SUBTOTAL				2,797	0	2,797	
SIOH (S&A)		5.0%		140	0	140	
CURRENT WORKING ESTIMATE				2,937	0	2,937	

Estimated Construction Time

365 Days

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 297331

3-404



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2973

TIME 08:16:49

CONTRACTOR DIRECT SUMMARY

SUMMARY PAGE 4

ID	CONTRACTOR	PM	QUANTITY	UOM	MANHRS	LABOR	EQUIPMENT	MAT	W/TX	AMOUNT	PCT	W/OH&P	SUBTOTAL
AA	GENERAL/PRIME		1.00	EA	11	361	2	1,735		2,098	100.0%	0	2,098
	TOTAL DIRECT				11	361	2	1,735		2,098	100.0%		

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 297331

3-405



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2973

TIME 08:16:49

CONTRACTOR INDIRECT SUMMARY

SUMMARY PAGE 5

-----			*** OVERHEAD ***			-----			**** PROFIT ****			-----			***** TOTAL CONTRACT *****		
ID	CONTRACTOR	PM	SUBTOTAL	AMOUNT	PCT	HOFC%	AMOUNT	PCT	BOND%	OTHR%	AMOUNT	PCT	UNIT	COST			
AA	GENERAL/PRIME		2,098	210	10.0%	0.0	173	7.5%	2.5%	0.0%	2,543	100.0%	2542.73				
				-----			-----										
				210	10.0%		173	7.5%									
			TOTAL OVERHEAD & PROFIT														

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 297331

3-406



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2973

TIME 08:16:49

CSI DIVISION SUMMARY

SUMMARY PAGE 6

ID CSI DIVISION	MANHOURS	LABOR	EQUIPMENT	MATERIAL	SALES TAX	***** TOTAL * DIRECT
16 ELECTRICAL	11	361	2	1,652	83	2,098
TOTAL DIRECT	11	361	2	1,652	83	2,098

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 297331

3-407



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2973

TIME 08:16:49

SYSTEMS SUMMARY

SUMMARY PAGE 7

ID SYSTEM	MANHOURS	LABOR	EQUIPMENT	MATERIAL	SALES TAX	***** TOTAL * DIRECT
11 INTERIOR ELECTRICAL	11	361	2	1,652	83	2,098
TOTAL DIRECT	11	361	2	1,652	83	2,098

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 297331

3-408



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2973

TIME 08:16:49

EQUIPMENT SUMMARY

SUMMARY PAGE 8

----- *** BOOK VALUE ***		ADJ FACTOR		ADJUSTD		BOOK OP --		HRLY ---		UPB		**** TOTAL ****		
EQUIP	DESCRIPTION	LIFE HRS	TL HRLY	OWNRSH	OWNS	OVTM	OWNRSH	EXPENSE	RATE	RATE	HOURS	COST		
EMI20	SMALL TOOLS								1.40	1.40	1	2		
											-----	-----		
TOTAL PROJECT EQUIPMENT HOURS												1	2	

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 297331

3-409



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2973

TIME 08:16:49

LABOR SUMMARY

SUMMARY PAGE 9

CRAFT DESCRIPTION	BASE	OVERTM	TXS/INS	FRNG	TRVL	HRLY RATE	UPB RATE	**** HOURS	**** TOTAL COST
LELEC ELECTRICIANS	20.50	0.0%	24.0%	7.49	0.00	32.91	25.79	11	361
TOTAL PROJECT MANHOURS								11	361

\* \* \* END OF SUMMARY REPORT \* \* \*

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 297331

3-410



# FORT KNOX LIMITED ENERGY STUDY

ECO 3.1: INSTALL PHOTOCELL LIGHTING CONTROLS TO REDUCE LIGHT LEVELS WHEN POSSIBLE  
30 SEPTEMBER 1993

## FACILITY LIGHTING CONTROL INSTALLATION - ON/OFF PHOTOCELLS

BUILDING #: 2974  
BUILDING FUNCTION: TANK REPAIR SHOP  
EXISTING FIXTURE DATA:  
LAMP TYPE METAL HALIDE  
FIXTURE WATTAGE 455 WATTS  
NUMBER OF FIXTURES 18

BUILDING USE:  
HOURS/DAY 8  
DAYS/WEEK 5

ELECTRIC COSTS:  
ENERGY CHARGE \$0.02506 PER KWH  
DEMAND CHARGE \$7.067 PER KW

### EXISTING LIGHTING CONTROL DATA

0 FIXTS. @ 0.455 KW @ 0% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.455 KW @ 10% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.455 KW @ 20% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.455 KW @ 40% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.455 KW @ 60% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.455 KW @ 80% OUTPUT \* 0 HR/YR = 0 KWH/YR  
18 FIXTS. @ 0.455 KW @ 100% OUTPUT \* 2,080 HR/YR = 17,035 KWH/YR

TOTAL EXISTING KWH 17,035

### REVISED LIGHTING CONTROL DATA

12 FIXTS. @ 0.455 KW @ 0% OUTPUT \* 920 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.455 KW @ 10% OUTPUT \* HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.455 KW @ 20% OUTPUT \* HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.455 KW @ 40% OUTPUT \* HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.455 KW @ 60% OUTPUT \* HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.455 KW @ 80% OUTPUT \* HR/YR = 0 KWH/YR  
12 FIXTS. @ 0.455 KW @ 100% OUTPUT \* 1,160 HR/YR = 6,334 KWH/YR  
6 FIXTS. @ 0.455 KW @ 100% OUTPUT \* 2,080 HR/YR = 5,678 KWH/YR

TOTAL REVISED CONTROL KWH 12,012

NET ENERGY SAVINGS

17.14 MBTU/YR

NET DOLLAR SAVINGS

\$357 /YR



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES

TIME 08:24:57

TITLE PAGE

---

LIMITED ENERGY STUDY  
FT KNOX, KY  
ECO-3.1: BUILDING 2974

Contract No: 27-93-C-0096

Prepared By: Systems Corp  
Estimator: Julie A. Hollensbe  
Estimate Prep. Date: 09/30/93

Current UPB/CSI ID: ORL290

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REW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 297431

3-412



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2974

TIME 08:24:57

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DETAILED ESTIMATE	DETAIL PAGE
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\* \* \* END TABLE OF CONTENTS \* \* \*



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2974

TIME 08:24:57

DETAILED ESTIMATE

DETAIL PAGE 1

1. BUILDING TO THE 5 FOOT LINE / AA. ELECTRICAL

BASE BID

DIVISION 16 ELECTRICAL		QUANTITY	UOM	CREW	MANHR	LABOR	EQUIPMENT	MATERIAL	SALESTX	DIRECT \$
16050 BASIC MATERIALS AND METHODS										
16120 1100 SINGLE SOLID CONDUCTOR.										
CD=4 EL 1102	NO. 12 AWG - TYPE THW INSULATION ***	UNIT COSTS: ***			7.14	215.37	0.97	72.72	3.64	292.69
WC=1100	0.72 MLF EELEF			5		155	1	52	3	211
16900 CONTROLS AND INSTRUMENTATION										
16930 2000 PHOTO-CELL, RELAY, LIGHTING ARRESTER, RECEPTACLE AND BRACKET										
CD=3 EL 2003	PHOTOCELL FOR ON/OFF CONTROL	*** UNIT COSTS: ***			0.63	20.63	0.08	600.00	30.00	650.71
WC=1100	BASED ON FOOTCANDLE READING	2.00 EA EELEB		1		41	0	1,200	60	1,301
CD=3 EL 2004	CIRCUIT FOR CONTROL PANEL FOR	*** UNIT COSTS: ***			1.25	41.26	0.16	100.00	5.00	146.42
WC=1100	ON/OFF PHOTOCELL CONTROL	4.00 EA EELEB		5		165	1	400	20	586
TOTAL DIVISION 16 ELECTRICAL					11	361	2	1,652	83	2,098
TOTAL FACILITY AA. ELECTRICAL					11	361	2	1,652	83	2,098
TOTAL BID ITEM 1. BUILDING TO THE 5 FOOT LINE					11	361	2	1,652	83	2,098
TOTAL BASE BID					11	361	2	1,652	83	2,098
TOTAL ADDITIVE					0	0	0	0	0	0
TOTAL INCL ADD LIMITED ENERGY STUDY					11	361	2	1,652	83	2,098

\* \* \* END OF DETAIL REPORT \* \* \*

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 297431

3-414



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2974

TIME 08:24:57

PROJECT NOTES

SUMMARY PAGE 1

---

PROJECT NOTES

ECO-3: FACILITY LIGHTING CONTROLS

SCOPE OF WORK: EVALUATE USE OF LIGHTING CONTROLS TO SAVE ENERGY IN  
SELECTED FACILITIES AT FT KNOX.

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 297431

3-415



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2974

TIME 08:24:57

BID ITEM AND FACILITY SUMMARY

SUMMARY PAGE 2

BID ITEM 1 BUILDING TO THE 5 FOOT LINE

BASE BID

ID	FACILITY		COST TO PRM	OVERHEAD	HOME OFC	PROFIT	BOND	OTHER FCTR	TOTAL COST	UNIT COST
AA	ELECTRICAL	1.00 EA	2,098	10.0% 210	0.0% 0	7.5% 173	2.5% 62	0.0% 0	2,543	2542.73
<hr/>										
BID ITEM TOTAL		1.00 EA	2,098	210	0	173	62	0	2,543	2542.73
<hr/>										
TOTAL BASE BID			2,098	210	0	173	62	0	2,543	
TOTAL ADDITIVE			0	0	0	0	0	0	0	
<hr/>										
TOTAL INCL ADD			2,098	210	0	173	62	0	2,543	

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 297431

3-416



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2974

TIME 08:24:57

PROJECT CWE SUMMARY

SUMMARY PAGE 3

ID	BID ITEM	QUANTITY	UOM	BASE BID	ADDITIVE	TOTAL COST	UNIT COST
	1. BUILDING TO THE 5 FOOT LINE	1.00	EA	2,543		2,543	2542.70
	TOTAL CURRENT CONTRACT COST			2,543	0	2,543	
	Cost Growth from 09/93 to 09/94 Index Values: 0000 0000	0.0%		0	0	0	
	ESCALATED CONTRACT COST			2,543	0	2,543	
	Government-Furnished Property			0		0	
	SUBTOTAL			2,543	0	2,543	
	Contingencies	10.0%		254	0	254	
	SUBTOTAL			2,797	0	2,797	
	SIOH (S&A)	5.0%		140	0	140	
	CURRENT WORKING ESTIMATE			2,937	0	2,937	

Estimated Construction Time 365 Days

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 297431

3-417



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2974

TIME 08:24:57

CONTRACTOR DIRECT SUMMARY

SUMMARY PAGE 4

ID	CONTRACTOR	PM	QUANTITY	UOM	MANHRS	LABOR	EQUIPMENT	MAT	W/TX	AMOUNT	PCT	W/OH&P	SUBTOTAL
AA	GENERAL/PRIME		1.00	EA	11	361	2	1,735		2,098	100.0%	0	2,098
	TOTAL DIRECT				11	361	2	1,735		2,098	100.0%		

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 297431

3-418



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2974

TIME 08:24:57

CONTRACTOR INDIRECT SUMMARY

SUMMARY PAGE 5

ID	CONTRACTOR	PM	SUBTOTAL	*** OVERHEAD ***	AMOUNT	PCT	HOFC%	**** PROFIT ****	AMOUNT	PCT	BOND%	OTHR%	***** TOTAL CONTRACT *****	AMOUNT	PCT	UNIT COST
AA	GENERAL/PRIME		2,098	210	10.0%	0.0		173	7.5%	2.5%	0.0%		2,543	100.0%		2542.73
	TOTAL OVERHEAD & PROFIT			210	10.0%			173	7.5%							

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 297431

3-419



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2974

TIME 08:24:57

CSI DIVISION SUMMARY

SUMMARY PAGE 6

ID CSI DIVISION	MANHOURS	LABOR	EQUIPMENT	MATERIAL	SALES TAX	***** TOTAL * DIRECT
16 ELECTRICAL	11	361	2	1,652	83	2,098
TOTAL DIRECT	11	361	2	1,652	83	2,098

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 297431

3-420



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2974

TIME 08:24:57

SYSTEMS SUMMARY

SUMMARY PAGE 7

ID SYSTEM	MANHOURS	LABOR	EQUIPMENT	MATERIAL	SALES TAX	***** TOTAL * DIRECT
11 INTERIOR ELECTRICAL	11	361	2	1,652	83	2,098
TOTAL DIRECT	11	361	2	1,652	83	2,098

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 297431

3-421



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2974

TIME 08:24:57

EQUIPMENT SUMMARY

SUMMARY PAGE 8

----- *** BOOK VALUE *** ADJ FACTOR ADJUSTD BOOK OP -- HRLY --- UPB **** TOTAL ****												
EQUIP DESCRIPTION	LIFE HRS	TL	HRLY	OWNRSH	OWNS	OVTM	OWNRSH	EXPENSE	RATE	RATE	HOURS	COST
EMI20 SMALL TOOLS									1.40	1.40	1	2
											-----	-----
TOTAL PROJECT EQUIPMENT HOURS											1	2

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 297431

3-422



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2974

TIME 08:24:57

LABOR SUMMARY

SUMMARY PAGE 9

CRAFT DESCRIPTION	BASE	OVERTH	TYS/INS	FRNG	TRVL	HRLY RATE	UPB RATE	**** HOURS	TOTAL COST
LELEC ELECTRICIANS	20.50	0.0%	24.0%	7.49	0.00	32.91	25.79	11	361
TOTAL PROJECT MANHOURS								11	361

\* \* \* END OF SUMMARY REPORT \* \* \*

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 297431

3-423



# FORT KNOX LIMITED ENERGY STUDY

ECO 3.1: INSTALL PHOTOCELL LIGHTING CONTROLS TO REDUCE LIGHT LEVELS WHEN POSSIBLE

30 SEPTEMBER 1993

## FACILITY LIGHTING CONTROL INSTALLATION - ON/OFF PHOTOCELLS

BUILDING #: 2979  
BUILDING FUNCTION: TANK REPAIR SHOP

BUILDING USE:  
HOURS/DAY 8  
DAYS/WEEK 5

### EXISTING FIXTURE DATA:

LAMP TYPE METAL HALIDE  
FIXTURE WATTAGE 455 WATTS  
NUMBER OF FIXTURES 18

ELECTRIC COSTS:  
ENERGY CHARGE \$0.02506 PER KWH  
DEMAND CHARGE \$7.067 PER KW

### EXISTING LIGHTING CONTROL DATA

0 FIXTS. @ 0.455 KW @ 0% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.455 KW @ 10% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.455 KW @ 20% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.455 KW @ 40% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.455 KW @ 60% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.455 KW @ 80% OUTPUT \* 0 HR/YR = 0 KWH/YR  
18 FIXTS. @ 0.455 KW @ 100% OUTPUT \* 2,080 HR/YR = 17,035 KWH/YR

TOTAL EXISTING KWH 17,035

### REVISED LIGHTING CONTROL DATA

12 FIXTS. @ 0.455 KW @ 0% OUTPUT \* 920 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.455 KW @ 10% OUTPUT \* HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.455 KW @ 20% OUTPUT \* HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.455 KW @ 40% OUTPUT \* HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.455 KW @ 60% OUTPUT \* HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.455 KW @ 80% OUTPUT \* HR/YR = 0 KWH/YR  
12 FIXTS. @ 0.455 KW @ 100% OUTPUT \* 1,160 HR/YR = 6,334 KWH/YR  
6 FIXTS. @ 0.455 KW @ 100% OUTPUT \* 2,080 HR/YR = 5,678 KWH/YR

TOTAL REVISED CONTROL KWH 12,012

NET ENERGY SAVINGS

17.14 MBTU/YR

NET DOLLAR SAVINGS

\$357 /YR



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES

TIME 08:31:50

TITLE PAGE

---

LIMITED ENERGY STUDY  
FT KNOX, KY  
ECO-3.1: BUILDING 2979

Contract No: 27-93-C-0096

Prepared By: Systems Corp  
Estimator: Julie A. Hollensbe  
Estimate Prep. Date: 09/30/93

Current UPB/CSI ID: ORL290

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CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 297931

3-425



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2979

TIME 08:31:50

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DETAILED ESTIMATE

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Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
 LIMITED ENERGY STUDY / FT KNOX, KY  
 ECO-3.1: BUILDING 2979  
 1. BUILDING TO THE 5 FOOT LINE / AA. ELECTRICAL

TIME 08:31:50

DETAILED ESTIMATE

DETAIL PAGE 1

BASE BID

DIVISION 16 ELECTRICAL	QUANTITY	UOM	CREW	MANHR	LABOR	EQUIPMENT	MATERIAL	SALESTX	DIRECT \$
16050 BASIC MATERIALS AND METHODS									
16120 1100 SINGLE SOLID CONDUCTOR.									
CD=4 EL 1102 NO. 12 AWG - TYPE THW INSULATION *** UNIT COSTS: ***				7.14	215.37	0.97	72.72	3.64	292.69
WC=1100				5	155	1	52	3	211
16900 CONTROLS AND INSTRUMENTATION									
16930 2000 PHOTO-CELL, RELAY, LIGHTING ARRESTER, RECEPTACLE AND BRACKET									
CD=3 EL 2003 PHOTOCELL FOR ON/OFF CONTROL *** UNIT COSTS: ***				0.63	20.63	0.08	600.00	30.00	650.71
WC=1100 BASED ON FOOTCANDLE READING				1	41	0	1,200	60	1,301
CD=3 EL 2004 CIRCUIT FOR CONTROL PANEL FOR *** UNIT COSTS: ***				1.25	41.26	0.16	100.00	5.00	146.42
WC=1100 ON/OFF PHOTOCELL CONTROL				5	165	1	400	20	586
TOTAL DIVISION 16 ELECTRICAL				11	361	2	1,652	83	2,098
TOTAL FACILITY AA. ELECTRICAL				11	361	2	1,652	83	2,098
TOTAL BID ITEM 1. BUILDING TO THE 5 FOOT LINE				11	361	2	1,652	83	2,098
TOTAL BASE BID				11	361	2	1,652	83	2,098
TOTAL ADDITIVE				0	0	0	0	0	0
TOTAL INCL ADD LIMITED ENERGY STUDY				11	361	2	1,652	83	2,098

\* \* \* END OF DETAIL REPORT \* \* \*

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 297931

3-427



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2979

TIME 08:31:50

PROJECT NOTES

SUMMARY PAGE 1

---

PROJECT NOTES

ECO-3: FACILITY LIGHTING CONTROLS

SCOPE OF WORK: EVALUATE USE OF LIGHTING CONTROLS TO SAVE ENERGY IN  
SELECTED FACILITIES AT FT KNOX.

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 297931

3-428



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2979

TIME 08:31:50

BID ITEM AND FACILITY SUMMARY

SUMMARY PAGE 2

BID ITEM 1 BUILDING TO THE 5 FOOT LINE

BASE BID

ID	FACILITY		COST TO PRM	OVERHEAD	HOME OFC	PROFIT	BOND	OTHER FCTR	TOTAL COST	UNIT COST
AA	ELECTRICAL	1.00 EA	2,098	10.0% 210	0.0% 0	7.5% 173	2.5% 62	0.0% 0	2,543	2542.73
<hr/>										
BID ITEM TOTAL		1.00 EA	2,098	210	0	173	62	0	2,543	2542.73
<hr/>										
TOTAL BASE BID			2,098	210	0	173	62	0	2,543	
TOTAL ADDITIVE			0	0	0	0	0	0	0	
<hr/>										
TOTAL INCL ADD			2,098	210	0	173	62	0	2,543	

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 297931

3-429



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
 LIMITED ENERGY STUDY / FT KNOX, KY  
 ECO-3.1: BUILDING 2979

TIME 08:31:50

PROJECT CWE SUMMARY

SUMMARY PAGE 3

ID	BID ITEM	QUANTITY	UOM	BASE BID	ADDITIVE	TOTAL COST	UNIT COST
1.	BUILDING TO THE 5 FOOT LINE	1.00	EA	2,543		2,543	2542.70
	TOTAL CURRENT CONTRACT COST			2,543	0	2,543	
	Cost Growth from 09/93 to 09/94 Index Values: 0000 0000	0.0%		0	0	0	
	ESCALATED CONTRACT COST			2,543	0	2,543	
	Government-Furnished Property			0		0	
	SUBTOTAL			2,543	0	2,543	
	Contingencies	10.0%		254	0	254	
	SUBTOTAL			2,797	0	2,797	
	SIOH (S&A)	5.0%		140	0	140	
	CURRENT WORKING ESTIMATE			2,937	0	2,937	

Estimated Construction Time 365 Days

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 297931

3-430



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2979

TIME 08:31:50

CONTRACTOR DIRECT SUMMARY

SUMMARY PAGE 4

ID	CONTRACTOR	PM	QUANTITY	UOM	MANHRS	LABOR	EQUIPMENT	MAT W/TX	AMOUNT	PCT	W/OH&P	SUBTOTAL
AA	GENERAL/PRIME		1.00	EA	11	361	2	1,735	2,098	100.0%	0	2,098
	TOTAL DIRECT				11	361	2	1,735	2,098	100.0%		

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 297931

3-431



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2979

TIME 08:31:50

CONTRACTOR INDIRECT SUMMARY

SUMMARY PAGE 5

ID	CONTRACTOR	PM	SUBTOTAL	*** OVERHEAD ***	AMOUNT	PCT	HOFC%	**** PROFIT ****	AMOUNT	PCT	BOND%	OTHR%	***** TOTAL CONTRACT *****	AMOUNT	PCT	UNIT COST
AA	GENERAL/PRIME		2,098	210	10.0%	0.0		173	7.5%	2.5%	0.0%		2,543	100.0%		2542.73
	TOTAL OVERHEAD & PROFIT			210	10.0%			173	7.5%							

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 297931

3-432



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2979

TIME 08:31:50

CSI DIVISION SUMMARY

SUMMARY PAGE 6

ID CSI DIVISION	MANHOURS	LABOR	EQUIPMENT	MATERIAL	SALES TAX	***** TOTAL * DIRECT
16 ELECTRICAL	11	361	2	1,652	83	2,098
TOTAL DIRECT	11	361	2	1,652	83	2,098

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 297931

3-433



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2979

TIME 08:31:50

SYSTEMS SUMMARY

SUMMARY PAGE 7

ID SYSTEM	MANHOURS	LABOR	EQUIPMENT	MATERIAL	SALES TAX	***** TOTAL * DIRECT
11 INTERIOR ELECTRICAL	11	361	2	1,652	83	2,098
TOTAL DIRECT	11	361	2	1,652	83	2,098

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 297931

3-434



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2979

TIME 08:31:50

EQUIPMENT SUMMARY

SUMMARY PAGE 8

----- *** BOOK VALUE *** ADJ FACTOR ADJUSTD BOOK OP -- HRLY --- UPB **** TOTAL ****												
EQUIP DESCRIPTION	LIFE HRS	TL	HRLY	OWNRSH	OWNS	OVTM	OWNRSH	EXPENSE	RATE	RATE	HOURS	COST
EMI20 SMALL TOOLS									1.40	1.40	1	2
											-----	-----
TOTAL PROJECT EQUIPMENT HOURS											1	2

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 297931

3-435



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2979

TIME 08:31:50

LABOR SUMMARY

SUMMARY PAGE 9

CRAFT DESCRIPTION	BASE	OVERTM	TXS/INS	FRNG	TRVL	HRLY RATE	UPB RATE	**** HOURS	TOTAL COST
LELEC ELECTRICIANS	20.50	0.0%	24.0%	7.49	0.00	32.91	25.79	11	361
TOTAL PROJECT MANHOURS								11	361

\* \* \* END OF SUMMARY REPORT \* \* \*

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 297931

3-436



# FORT KNOX LIMITED ENERGY STUDY

ECO 3.1: INSTALL PHOTOCELL LIGHTING CONTROLS TO REDUCE LIGHT LEVELS WHEN POSSIBLE  
30 SEPTEMBER 1993

## FACILITY LIGHTING CONTROL INSTALLATION - ON/OFF PHOTOCELLS

BUILDING #: 2980  
BUILDING FUNCTION: TANK REPAIR SHOP  
EXISTING FIXTURE DATA:  
LAMP TYPE: METAL HALIDE  
FIXTURE WATTAGE: 455 WATTS  
NUMBER OF FIXTURES: 18

BUILDING USE:  
HOURS/DAY: 8  
DAYS/WEEK: 5

ELECTRIC COSTS:  
ENERGY CHARGE: \$0.02506 PER KWH  
DEMAND CHARGE: \$7.067 PER KW

### EXISTING LIGHTING CONTROL DATA

0 FIXTS. @ 0.455 KW @ 0% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.455 KW @ 10% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.455 KW @ 20% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.455 KW @ 40% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.455 KW @ 60% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.455 KW @ 80% OUTPUT \* 0 HR/YR = 0 KWH/YR  
18 FIXTS. @ 0.455 KW @ 100% OUTPUT \* 2,080 HR/YR = 17,035 KWH/YR

TOTAL EXISTING KWH

17,035

### REVISED LIGHTING CONTROL DATA

12 FIXTS. @ 0.455 KW @ 0% OUTPUT \* 920 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.455 KW @ 10% OUTPUT \* HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.455 KW @ 20% OUTPUT \* HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.455 KW @ 40% OUTPUT \* HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.455 KW @ 60% OUTPUT \* HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.455 KW @ 80% OUTPUT \* HR/YR = 0 KWH/YR  
12 FIXTS. @ 0.455 KW @ 100% OUTPUT \* 1,160 HR/YR = 6,334 KWH/YR  
6 FIXTS. @ 0.455 KW @ 100% OUTPUT \* 2,080 HR/YR = 5,678 KWH/YR

TOTAL REVISED CONTROL KWH

12,012

NET ENERGY SAVINGS

17.14 MBTU/YR

NET DOLLAR SAVINGS

\$557 /YR



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES

TIME 08:38:53

TITLE PAGE

---

LIMITED ENERGY STUDY  
FT KNOX, KY  
ECO-3.1: BUILDING 2980

Contract No: 27-93-C-0096

Prepared By: Systems Corp  
Estimator: Julie A. Hollensbe  
Estimate Prep. Date: 09/30/93  
Current UPB/CSI ID: ORL290

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CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 298031

3-438



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2980

TIME 08:38:53

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DETAILED ESTIMATE

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\* \* \* END TABLE OF CONTENTS \* \* \*



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2980

TIME 08:38:53

DETAILED ESTIMATE

DETAIL PAGE 1

1. BUILDING TO THE 5 FOOT LINE / AA. ELECTRICAL

BASE BID

DIVISION 16 ELECTRICAL		QUANTITY	UOM	CREW	MANHR	LABOR	EQUIPMENT	MATERIAL	SALESTX	DIRECT \$
16050 BASIC MATERIALS AND METHODS										
16120 1100 SINGLE SOLID CONDUCTOR.										
CD=4 EL 1102	NO. 12 AWC - TYPE THW INSULATION ***	UNIT COSTS: ***			7.14	215.37	0.97	72.72	3.64	292.69
WC=1100		0.72 MLF EELEF		5	155		1	52	3	211
16900 CONTROLS AND INSTRUMENTATION										
16930 2000 PHOTO-CELL, RELAY, LIGHTING ARRESTER, RECEPTACLE AND BRACKET										
CD=3 EL 2003	PHOTOCELL FOR ON/OFF CONTROL	*** UNIT COSTS: ***			0.63	20.63	0.08	600.00	30.00	650.71
WC=1100	BASED ON FOOTCANDLE READING	2.00 EA EELEB		1	41		0	1,200	60	1,301
CD=3 EL 2004	CIRCUIT FOR CONTROL PANEL FOR	*** UNIT COSTS: ***			1.25	41.26	0.16	100.00	5.00	146.42
WC=1100	ON/OFF PHOTOCELL CONTROL	4.00 EA EELEB		5	165		1	400	20	586
TOTAL DIVISION 16 ELECTRICAL					11	361	2	1,652	83	2,098
TOTAL FACILITY AA. ELECTRICAL					11	361	2	1,652	83	2,098
TOTAL BID ITEM 1. BUILDING TO THE 5 FOOT LINE					11	361	2	1,652	83	2,098
TOTAL BASE BID					11	361	2	1,652	83	2,098
TOTAL ADDITIVE					0	0	0	0	0	0
TOTAL INCL ADD LIMITED ENERGY STUDY					11	361	2	1,652	83	2,098

\* \* \* END OF DETAIL REPORT \* \* \*

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 298031

3-440



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2980

TIME 08:38:53

PROJECT NOTES

SUMMARY PAGE 1

---

PROJECT NOTES

ECO-3: FACILITY LIGHTING CONTROLS

SCOPE OF WORK: EVALUATE USE OF LIGHTING CONTROLS TO SAVE ENERGY IN  
SELECTED FACILITIES AT FT KNOX.

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 298031

3-441



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2980

TIME 08:38:53

BID ITEM AND FACILITY SUMMARY

SUMMARY PAGE 2

BID ITEM 1 BUILDING TO THE 5 FOOT LINE

BASE BID

ID	FACILITY		COST TO PRM	OVERHEAD	HOME OFC	PROFIT	BOND	OTHR	FCTR	TOTAL COST	UNIT COST
AA	ELECTRICAL			10.0%	0.0%	7.5%	2.5%	0.0%			
		1.00 EA	2,098	210	0	173	62	0		2,543	2542.73
BID ITEM TOTAL		1.00 EA	2,098	210	0	173	62	0		2,543	2542.73
TOTAL BASE BID			2,098	210	0	173	62	0		2,543	
TOTAL ADDITIVE			0	0	0	0	0	0		0	
TOTAL INCL ADD			2,098	210	0	173	62	0		2,543	

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 298031

3-442



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2980

TIME 08:38:53

PROJECT CWE SUMMARY

SUMMARY PAGE 3

ID	BID ITEM	QUANTITY	UOM	BASE BID	ADDITIVE	TOTAL COST	UNIT COST
	1. BUILDING TO THE 5 FOOT LINE	1.00	EA	2,543		2,543	2542.70
	TOTAL CURRENT CONTRACT COST			2,543	0	2,543	
	Cost Growth from 09/93 to 09/94 Index Values: 0000 0000	0.0%		0	0	0	
	ESCALATED CONTRACT COST			2,543	0	2,543	
	Government-Furnished Property			0		0	
	SUBTOTAL			2,543	0	2,543	
	Contingencies	10.0%		254	0	254	
	SUBTOTAL			2,797	0	2,797	
	SIOH (S&A)	5.0%		140	0	140	
	CURRENT WORKING ESTIMATE			2,937	0	2,937	
	Estimated Construction Time	365	Days				

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 298031

3-443



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2980

TIME 08:38:53

CONTRACTOR DIRECT SUMMARY

SUMMARY PAGE 4

ID	CONTRACTOR	PM	QUANTITY	UOM	MANHRS	LABOR	EQUIPMENT	MAT W/TX	AMOUNT	PCT	W/OH&P	SUBTOTAL
AA	GENERAL/PRIME		1.00	EA	11	361	2	1,735	2,098	100.0%	0	2,098
	TOTAL DIRECT				11	361	2	1,735	2,098	100.0%		

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 298031

3-444



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2980

TIME 08:38:53

CONTRACTOR INDIRECT SUMMARY

SUMMARY PAGE 5

ID	CONTRACTOR	PM	SUBTOTAL	*** OVERHEAD *** AMOUNT	PCT	HOFC%	**** PROFIT **** AMOUNT	PCT	BOND%	OTHER%	***** TOTAL CONTRACT ***** AMOUNT	PCT	UNIT COST
AA	GENERAL/PRIME		2,098	210	10.0%	0.0	173	7.5%	2.5%	0.0%	2,543	100.0%	2542.73
	TOTAL OVERHEAD & PROFIT			210	10.0%		173	7.5%					

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 298031

3-445



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2980

TIME 08:38:53

CSI DIVISION SUMMARY

SUMMARY PAGE 6

ID CSI DIVISION	MANHOURS	LABOR	EQUIPMENT	MATERIAL	SALES TAX	***** TOTAL * DIRECT
16 ELECTRICAL	11	361	2	1,652	83	2,098
TOTAL DIRECT	11	361	2	1,652	83	2,098

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 298031

3-446



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2980

TIME 08:38:53

SYSTEMS SUMMARY

SUMMARY PAGE 7

ID SYSTEM	MANHOURS	LABOR	EQUIPMENT	MATERIAL	SALES TAX	***** TOTAL * DIRECT
11 INTERIOR ELECTRICAL	11	361	2	1,652	83	2,098
TOTAL DIRECT	11	361	2	1,652	83	2,098

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 298031

3-447



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2980

TIME 08:38:53

EQUIPMENT SUMMARY

SUMMARY PAGE 8

----- *** BOOK VALUE ***		ADJ FACTOR		ADJUSTD		BOOK OP --		HRLY	---	UPB	****	TOTAL	****
EQUIP	DESCRIPTION	LIFE HRS	TL	HRLY	OWNRSH	OWNS	OVTM	OWNRSH	EXPENSE	RATE	RATE	HOURS	COST
EMI20	SMALL TOOLS									1.40	1.40	1	2
												1	2
TOTAL PROJECT EQUIPMENT HOURS													

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 298031

3-448



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2980

TIME 08:38:53

LABOR SUMMARY

SUMMARY PAGE 9

CRAFT DESCRIPTION	BASE	OVERTM	TXS/INS	FRNG	TRVL	HRLY RATE	UPB RATE	**** HOURS	TOTAL COST
LELEC ELECTRICIANS	20.50	0.0%	24.0%	7.49	0.00	32.91	25.79	11	361
TOTAL PROJECT MANHOURS								11	361

\* \* \* END OF SUMMARY REPORT \* \* \*

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 298031

3-449



# FORT KNOX LIMITED ENERGY STUDY

ECO 3.1: INSTALL PHOTOCELL LIGHTING CONTROLS TO REDUCE LIGHT LEVELS WHEN POSSIBLE  
30 SEPTEMBER 1993

## FACILITY LIGHTING CONTROL INSTALLATION - ON/OFF PHOTOCELLS

BUILDING #: 5220  
BUILDING FUNCTION: AIRPLANE HANGER  
EXISTING FIXTURE DATA:  
LAMP TYPE METAL HALIDE  
FIXTURE WATTAGE 1100 WATTS  
NUMBER OF FIXTURES 48

BUILDING USE:  
HOURS/DAY 15.5  
DAYS/WEEK 7

ELECTRIC COSTS:  
ENERGY CHARGE \$0.02506 PER KWH  
DEMAND CHARGE \$7.067 PER KW

### EXISTING LIGHTING CONTROL DATA

0 FIXTS. @ 1.100 KW @ 0% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 1.100 KW @ 10% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 1.100 KW @ 20% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 1.100 KW @ 40% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 1.100 KW @ 60% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 1.100 KW @ 80% OUTPUT \* 0 HR/YR = 0 KWH/YR  
48 FIXTS. @ 1.100 KW @ 100% OUTPUT \* 5,642 HR/YR = 297,898 KWH/YR

TOTAL EXISTING KWH 297,898

### REVISED LIGHTING CONTROL DATA

32 FIXTS. @ 1.100 KW @ 0% OUTPUT \* 2,084 HR/YR = 0 KWH/YR  
0 FIXTS. @ 1.100 KW @ 10% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 1.100 KW @ 20% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 1.100 KW @ 40% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 1.100 KW @ 60% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 1.100 KW @ 80% OUTPUT \* 0 HR/YR = 0 KWH/YR  
48 FIXTS. @ 1.100 KW @ 100% OUTPUT \* 3,578 HR/YR = 188,918 KWH/YR  
16 FIXTS. @ 1.100 KW @ 100% OUTPUT \* 2,084 HR/YR = 36,326 KWH/YR

TOTAL REVISED CONTROL KWH 225,244

NET ENERGY SAVINGS

247.90 MBTU/YR

NET DOLLAR SAVINGS

\$3,313 /YR



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES

TIME 09:06:05

TITLE PAGE

---

LIMITED ENERGY STUDY  
FT KNOX, KY  
ECO-3.1: BUILDING 5220

Contract No: 27-93-C-0096

Prepared By: Systems Corp  
Estimator: Julie A. Hollensbe  
Estimate Prep. Date: 09/30/93

Current UPB/CSI ID: ORL290

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CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 522031

3-451



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 5220

TIME 09:06:05

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DETAILED ESTIMATE	DETAIL PAGE
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Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
 LIMITED ENERGY STUDY / FT KNOX, KY  
 ECO-3.1: BUILDING 5220  
 1. BUILDING TO THE 5 FOOT LINE / AA. ELECTRICAL

TIME 09:06:05

DETAILED ESTIMATE

DETAIL PAGE 1

BASE BID

DIVISION 16 ELECTRICAL	QUANTITY	UOM	CREW	MANHR	LABOR	EQUIPMENT	MATERIAL	SALESTX	DIRECT \$
16050 BASIC MATERIALS AND METHODS									
16120 1100 SINGLE SOLID CONDUCTOR.									
CD=4 EL 1102 NO. 12 AWG - TYPE THW INSULATION *** UNIT COSTS: ***	7.14				215.37	0.97	72.72	3.64	292.69
WC=1100 1.08 MLF EELEF	8				233	1	79	4	316
16900 CONTROLS AND INSTRUMENTATION									
16930 2000 PHOTO-CELL, RELAY, LIGHTING ARRESTER, RECEPTACLE AND BRACKET									
CD=3 EL 2003 PHOTOCELL FOR ON/OFF CONTROL *** UNIT COSTS: ***	0.63				20.63	0.08	600.00	30.00	650.71
WC=1100 BASED ON FOOTCANDLE READING 3.00 EA EELEB	2				62	0	1,800	90	1,952
CD=3 EL 2004 CIRCUIT FOR CONTROL PANEL FOR *** UNIT COSTS: ***	1.25				41.26	0.16	100.00	5.00	146.42
WC=1100 ON/OFF PHOTOCELL CONTROL 12.00 EA EELEB	15				495	2	1,200	60	1,757
TOTAL DIVISION 16 ELECTRICAL	25				790	3	3,079	154	4,025
TOTAL FACILITY AA. ELECTRICAL	25				790	3	3,079	154	4,025
TOTAL BID ITEM 1. BUILDING TO THE 5 FOOT LINE	25				790	3	3,079	154	4,025
TOTAL BASE BID	25				790	3	3,079	154	4,025
TOTAL ADDITIVE	0				0	0	0	0	0
TOTAL INCL ADD LIMITED ENERGY STUDY	25				790	3	3,079	154	4,025

\* \* \* END OF DETAIL REPORT \* \* \*

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 522031

3-453



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 5220

TIME 09:06:05

PROJECT NOTES

SUMMARY PAGE 1

---

PROJECT NOTES

ECO-3: FACILITY LIGHTING CONTROLS

SCOPE OF WORK: EVALUATE USE OF LIGHTING CONTROLS TO SAVE ENERGY IN  
SELECTED FACILITIES AT FT KNOX.

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 522031

3-454



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 5220

TIME 09:06:05

BID ITEM AND FACILITY SUMMARY

SUMMARY PAGE 2

BID ITEM 1 BUILDING TO THE 5 FOOT LINE

BASE BID

ID	FACILITY		COST TO PRM	OVERHEAD	HOME OFC	PROFIT	BOND	OTHR FCTR	TOTAL COST	UNIT COST
AA	ELECTRICAL	1.00 EA	4,025	10.0% 403	0.0% 0	7.5% 332	2.5% 119	0.0% 0	4,879	4878.95
BID ITEM TOTAL		1.00 EA	4,025	403	0	332	119	0	4,879	4878.95
TOTAL BASE BID			4,025	403	0	332	119	0	4,879	
TOTAL ADDITIVE			0	0	0	0	0	0	0	
TOTAL INCL ADD			4,025	403	0	332	119	0	4,879	

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 522031

3-455



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 5220

TIME 09:06:05

PROJECT CWE SUMMARY

SUMMARY PAGE 3

ID	BID ITEM	QUANTITY UOM	BASE BID	ADDITIVE	TOTAL COST	UNIT COST
1.	BUILDING TO THE 5 FOOT LINE	1.00 EA	4,879		4,879	4879.00
	TOTAL CURRENT CONTRACT COST		4,879	0	4,879	
	Cost Growth from 09/93 to 09/94 Index Values: 0000 0000	0.0%	0	0	0	
	ESCALATED CONTRACT COST		4,879	0	4,879	
	Government-Furnished Property		0		0	
	SUBTOTAL		4,879	0	4,879	
	Contingencies	10.0%	488	0	488	
	SUBTOTAL		5,367	0	5,367	
	SIOH (S&A)	5.0%	268	0	268	
	CURRENT WORKING ESTIMATE		5,635	0	5,635	

Estimated Construction Time 365 Days

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 522031

3-456



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 5220

TIME 09:06:05

CONTRACTOR DIRECT SUMMARY

SUMMARY PAGE 4

ID	CONTRACTOR	PM	QUANTITY	UOM	MANHRS	LABOR	EQUIPMENT	MAT W/TX	** TOTAL DIRECT * AMOUNT PCT	* SUBCON * W/OH&P	SUBTOTAL
AA	GENERAL/PRIME		1.00	EA	25	790	3	3,232	4,025 100.0%	0	4,025
	TOTAL DIRECT				25	790	3	3,232	4,025 100.0%		

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 522031

3-457



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 5220

TIME 09:06:05

CONTRACTOR INDIRECT SUMMARY

SUMMARY PAGE 5

----- *** OVERHEAD *** ----- **** PROFIT **** ----- ***** TOTAL CONTRACT *****											
ID	CONTRACTOR	PM	SUBTOTAL	AMOUNT	PCT	HOFC%	AMOUNT	PCT	BOND%	OTHR%	AMOUNT PCT UNIT COST
AA	GENERAL/PRIME		4,025	403	10.0%	0.0	332	7.5%	2.5%	0.0%	4,879 100.0% 4878.94
	TOTAL OVERHEAD & PROFIT			403	10.0%		332	7.5%			

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 522031

3-458



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 5220

TIME 09:06:05

CSI DIVISION SUMMARY

SUMMARY PAGE 6

ID CSI DIVISION	MANHOURS	LABOR	EQUIPMENT	MATERIAL	SALES TAX	***** TOTAL * DIRECT
16 ELECTRICAL	25	790	3	3,079	154	4,025
TOTAL DIRECT	25	790	3	3,079	154	4,025

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 522031

3-459



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 5220

TIME 09:06:05

SYSTEMS SUMMARY

SUMMARY PAGE 7

ID SYSTEM	MANHOURS	LABOR	EQUIPMENT	MATERIAL	SALES TAX	***** TOTAL * DIRECT
11 INTERIOR ELECTRICAL	25	790	3	3,079	154	4,025
TOTAL DIRECT	25	790	3	3,079	154	4,025

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 522031

3-460



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 5220

TIME 09:06:05

EQUIPMENT SUMMARY

SUMMARY PAGE 8

----- *** BOOK VALUE *** ADJ FACTOR ADJUSTD BOOK OP -- HRLY --- UPB **** TOTAL ****													
EQUIP DESCRIPTION	LIFE HRS	TL	HRLY	OWNRSH	OWNS	OVTM	OWNRSH	EXPENSE	RATE	RATE	HOURS	COST	
-----													
EMI20 SMALL TOOLS									1.40	1.40	2	3	
											-----	-----	
TOTAL PROJECT EQUIPMENT HOURS												2	3

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 522031

3-461



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 5220

TIME 09:06:05

LABOR SUMMARY

SUMMARY PAGE 9

CRAFT DESCRIPTION	BASE	OVERTM	TXS/INS	FRNG	TRVL	HRLY RATE	UPB RATE	**** HOURS	TOTAL COST
LELEC ELECTRICIANS	20.50	0.0%	24.0%	7.49	0.00	32.91	25.79	25	790
TOTAL PROJECT MANHOURS								25	790

\* \* \* END OF SUMMARY REPORT \* \* \*

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 522031

3-462



# FORT KNOX LIMITED ENERGY STUDY

ECO 3.1: INSTALL PHOTOCELL LIGHTING CONTROLS TO REDUCE LIGHT LEVELS WHEN POSSIBLE  
30 SEPTEMBER 1993

## FACILITY LIGHTING CONTROL INSTALLATION - ON/OFF PHOTOCELLS

BUILDING #: 5222  
BUILDING FUNCTION: AIRPLANE HANGER

BUILDING USE:  
HOURS/DAY 8.5  
DAYS/WEEK 5

### EXISTING FIXTURE DATA:

LAMP TYPE METAL HALIDE  
FIXTURE WATTAGE 1100 WATTS  
NUMBER OF FIXTURES 40

### ELECTRIC COSTS:

ENERGY CHARGE \$0.02506 PER KWH  
DEMAND CHARGE \$7.067 PER KW

### EXISTING LIGHTING CONTROL DATA

0 FIXTS. @ 1.100 KW @ 0% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 1.100 KW @ 10% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 1.100 KW @ 20% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 1.100 KW @ 40% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 1.100 KW @ 60% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 1.100 KW @ 80% OUTPUT \* 0 HR/YR = 0 KWH/YR  
40 FIXTS. @ 1.100 KW @ 100% OUTPUT \* 2,210 HR/YR = 97,240 KWH/YR

TOTAL EXISTING KWH 97,240

### REVISED LIGHTING CONTROL DATA

29 FIXTS. @ 1.100 KW @ 0% OUTPUT \* 985 HR/YR = 0 KWH/YR  
0 FIXTS. @ 1.100 KW @ 10% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 1.100 KW @ 20% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 1.100 KW @ 40% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 1.100 KW @ 60% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 1.100 KW @ 80% OUTPUT \* 0 HR/YR = 0 KWH/YR  
40 FIXTS. @ 1.100 KW @ 100% OUTPUT \* 1,225 HR/YR = 53,900 KWH/YR  
11 FIXTS. @ 1.100 KW @ 100% OUTPUT \* 985 HR/YR = 11,919 KWH/YR

TOTAL REVISED CONTROL KWH 65,819

NET ENERGY SAVINGS 107.21 MBTU/YR

NET DOLLAR SAVINGS \$2,140 /YR



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES

TIME 08:58:46

TITLE PAGE

---

LIMITED ENERGY STUDY  
FT KNOX, KY  
ECO-3.1: BUILDING 5222

Contract No: 27-93-C-0096

Prepared By: Systems Corp  
Estimator: Julie A. Hollensbe  
Estimate Prep. Date: 09/30/93

Current UPB/CSI ID: ORL290

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CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 522231

3-464



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 5222

TIME 08:58:46

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DETAILED ESTIMATE	DETAIL PAGE
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Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
 LIMITED ENERGY STUDY / FT KNOX, KY  
 ECO-3.1: BUILDING 5222

TIME 08:58:46

DETAILED ESTIMATE

DETAIL PAGE 1

1. BUILDING TO THE 5 FOOT LINE / AA. ELECTRICAL

BASE BID

DIVISION 16 ELECTRICAL		QUANTITY	UOM	CREW	MANHR	LABOR	EQUIPMENT	MATERIAL	SALESTX	DIRECT \$
16050 BASIC MATERIALS AND METHODS										
16120 1100 SINGLE SOLID CONDUCTOR.										
CD=4 EL 1102	NO. 12 AWG - TYPE THW INSULATION *** UNIT COSTS: ***	7.14				215.37	0.97	72.72	3.64	292.69
WC=1100	1.08 MLF EELEF	8				233	1	79	4	316
16900 CONTROLS AND INSTRUMENTATION										
16930 2000 PHOTO-CELL, RELAY, LIGHTING ARRESTER, RECEPTACLE AND BRACKET										
CD=3 EL 2003	PHOTOCELL FOR ON/OFF CONTROL *** UNIT COSTS: ***	0.63				20.63	0.08	600.00	30.00	650.71
WC=1100	BASED ON FOOTCANDLE READING 3.00 EA EELEB	2				62	0	1,800	90	1,952
CD=3 EL 2004	CIRCUIT FOR CONTROL PANEL FOR *** UNIT COSTS: ***	1.25				41.26	0.16	100.00	5.00	146.42
WC=1100	ON/OFF PHOTOCELL CONTROL 10.00 EA EELEB	13				413	2	1,000	50	1,464
TOTAL DIVISION 16 ELECTRICAL		22				707	3	2,879	144	3,732
TOTAL FACILITY AA. ELECTRICAL		22				707	3	2,879	144	3,732
TOTAL BID ITEM 1. BUILDING TO THE 5 FOOT LINE		22				707	3	2,879	144	3,732
TOTAL BASE BID		22				707	3	2,879	144	3,732
TOTAL ADDITIVE		0				0	0	0	0	0
TOTAL INCL ADD LIMITED ENERGY STUDY		22				707	3	2,879	144	3,732

\* \* \* END OF DETAIL REPORT \* \* \*

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 522231

3-466



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 5222

TIME 08:58:46

PROJECT NOTES

SUMMARY PAGE 1

---

PROJECT NOTES

ECO-3: FACILITY LIGHTING CONTROLS

SCOPE OF WORK: EVALUATE USE OF LIGHTING CONTROLS TO SAVE ENERGY IN  
SELECTED FACILITIES AT FT KNOX.

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 522231

3-467



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 5222

TIME 08:58:46

BID ITEM AND FACILITY SUMMARY

SUMMARY PAGE 2

BID ITEM 1 BUILDING TO THE 5 FOOT LINE

BASE BID

ID	FACILITY		COST TO PRM	OVERHEAD	HOME OFC	PROFIT	BOND	OTHR FCTR	TOTAL COST	UNIT COST
AA	ELECTRICAL	1.00 EA	3,732	10.0% 373	0.0% 0	7.5% 308	2.5% 110	0.0% 0	4,524	4524.00
<hr/>										
BID ITEM TOTAL		1.00 EA	3,732	373	0	308	110	0	4,524	4524.00
<hr/>										
TOTAL BASE BID			3,732	373	0	308	110	0	4,524	
TOTAL ADDITIVE			0	0	0	0	0	0	0	
<hr/>										
TOTAL INCL ADD			3,732	373	0	308	110	0	4,524	

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 522231

3-468



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
 LIMITED ENERGY STUDY / FT KNOX, KY  
 ECO-3.1: BUILDING 5222

TIME 08:58:46

PROJECT CWE SUMMARY

SUMMARY PAGE 3

ID	BID ITEM	QUANTITY UOM	BASE BID	ADDITIVE	TOTAL COST	UNIT COST
	1. BUILDING TO THE 5 FOOT LINE	1.00 EA	4,524		4,524	4524.00
	TOTAL CURRENT CONTRACT COST		4,524	0	4,524	
	Cost Growth from 09/93 to 09/94 Index Values: 0000 0000	0.0%	0	0	0	
	ESCALATED CONTRACT COST		4,524	0	4,524	
	Government-Furnished Property		0		0	
	SUBTOTAL		4,524	0	4,524	
	Contingencies	10.0%	452	0	452	
	SUBTOTAL		4,976	0	4,976	
	SIOH (S&A)	5.0%	249	0	249	
	CURRENT WORKING ESTIMATE		5,225	0	5,225	
	Estimated Construction Time	365 Days				

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 522231

3-469



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 5222

TIME 08:58:46

CONTRACTOR DIRECT SUMMARY

SUMMARY PAGE 4

ID	CONTRACTOR	PM	QUANTITY	UOM	MANHRS	LABOR	EQUIPMENT	MAT W/TX	** TOTAL DIRECT ** AMOUNT PCT	** SUBCON ** W/OH&P	SUBTOTAL
AA	GENERAL/PRIME		1.00	EA	22	707	3	3,022	3,732 100.0%	0	3,732
	TOTAL DIRECT				22	707	3	3,022	3,732 100.0%		

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 522231

3-470



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 5222

TIME 08:58:46

CONTRACTOR INDIRECT SUMMARY

SUMMARY PAGE 5

-----			*** OVERHEAD ***			-----			**** PROFIT ****			-----			***** TOTAL CONTRACT *****		
ID	CONTRACTOR	PM	SUBTOTAL	AMOUNT	PCT	HOFC%	AMOUNT	PCT	BOND%	OTHR%	AMOUNT	PCT	UNIT	COST			
AA	GENERAL/PRIME		3,732	373	10.0%	0.0	308	7.5%	2.5%	0.0%	4,524	100.0%	4523.99				
	TOTAL OVERHEAD & PROFIT			373	10.0%		308	7.5%									

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 522231

3-471



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 5222

TIME 08:58:46

CSI DIVISION SUMMARY

SUMMARY PAGE 6

ID CSI DIVISION	MANHOURS	LABOR	EQUIPMENT	MATERIAL	SALES TAX	***** TOTAL * DIRECT
16 ELECTRICAL	22	707	3	2,879	144	3,732
TOTAL DIRECT	22	707	3	2,879	144	3,732

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 522231

3-472



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 5222

TIME 08:58:46

SYSTEMS SUMMARY

SUMMARY PAGE 7

ID SYSTEM	MANHOURS	LABOR	EQUIPMENT	MATERIAL	SALES TAX	***** TOTAL * DIRECT
11 INTERIOR ELECTRICAL	22	707	3	2,879	144	3,732
TOTAL DIRECT	22	707	3	2,879	144	3,732

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 522231

3-473



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 5222

TIME 08:58:46

EQUIPMENT SUMMARY

SUMMARY PAGE 8

EQUIP	DESCRIPTION	LIFE HRS	TL HRLY	OWNRSH	OWNS	OVTM	OWNRSH	EXPENSE	HRLY RATE	UPB RATE	**** HOURS	TOTAL COST
EMI20	SMALL TOOLS								1.40	1.40	2	3
											2	3
TOTAL PROJECT EQUIPMENT HOURS												

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 522231

3-474



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 5222

TIME 08:58:46

LABOR SUMMARY

SUMMARY PAGE 9

CRAFT DESCRIPTION	BASE	OVERTM	TXS/INS	FRNG	TRVL	HRLY RATE	UPB RATE	**** HOURS	TOTAL **** COST
LELEC ELECTRICIANS	20.50	0.0%	24.0%	7.49	0.00	32.91	25.79	22	708
TOTAL PROJECT MANHOURS								22	708

\* \* \* END OF SUMMARY REPORT \* \* \*

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 522231

3-475



# FORT KNOX LIMITED ENERGY STUDY

ECO 3.1: INSTALL PHOTOCELL LIGHTING CONTROLS TO REDUCE LIGHT LEVELS WHEN POSSIBLE  
30 SEPTEMBER 1993

## FACILITY LIGHTING CONTROL INSTALLATION - ON/OFF PHOTOCELLS

BUILDING #: 5253  
BUILDING FUNCTION: AIRCRAFT MAINTENANCE SHOP  
EXISTING FIXTURE DATA:  
LAMP TYPE: METAL HALIDE  
FIXTURE WATTAGE: 1100 WATTS  
NUMBER OF FIXTURES: 30

BUILDING USE:  
HOURS/DAY: 8.5  
DAYS/WEEK: 5

ELECTRIC COSTS:  
ENERGY CHARGE: \$0.02506 PER KWH  
DEMAND CHARGE: \$7.067 PER KW

### EXISTING LIGHTING CONTROL DATA

0 FIXTS. @ 1.100 KW @ 0% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 1.100 KW @ 10% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 1.100 KW @ 20% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 1.100 KW @ 40% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 1.100 KW @ 60% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 1.100 KW @ 80% OUTPUT \* 0 HR/YR = 0 KWH/YR  
30 FIXTS. @ 1.100 KW @ 100% OUTPUT \* 2,210 HR/YR = 72,930 KWH/YR

TOTAL EXISTING KWH

72,930

### REVISED LIGHTING CONTROL DATA

21 FIXTS. @ 1.100 KW @ 0% OUTPUT \* 985 HR/YR = 0 KWH/YR  
0 FIXTS. @ 1.100 KW @ 10% OUTPUT \* HR/YR = 0 KWH/YR  
0 FIXTS. @ 1.100 KW @ 20% OUTPUT \* HR/YR = 0 KWH/YR  
0 FIXTS. @ 1.100 KW @ 40% OUTPUT \* HR/YR = 0 KWH/YR  
0 FIXTS. @ 1.100 KW @ 60% OUTPUT \* HR/YR = 0 KWH/YR  
0 FIXTS. @ 1.100 KW @ 80% OUTPUT \* HR/YR = 0 KWH/YR  
21 FIXTS. @ 1.100 KW @ 100% OUTPUT \* 1,225 HR/YR = 28,298 KWH/YR  
9 FIXTS. @ 1.100 KW @ 100% OUTPUT \* 2,210 HR/YR = 21,879 KWH/YR

TOTAL REVISED CONTROL KWH

50,177

NET ENERGY SAVINGS

77.63 MBTU/YR

NET DOLLAR SAVINGS

\$1,550 /YR



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES

TIME 09:13:10

TITLE PAGE

---

LIMITED ENERGY STUDY  
FT KNOX, KY  
ECO-3.1: BUILDING 5253

Contract No: 27-93-C-0096

Prepared By: Systems Corp  
Estimator: Julie A. Hollensbe  
Estimate Prep. Date: 09/30/93  
Current UPB/CSI ID: ORL290

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CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 525331

3-477



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 5253

TIME 09:13:10

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Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
 LIMITED ENERGY STUDY / FT KNOX, KY  
 ECO-3.1: BUILDING 5253  
 1. BUILDING TO THE 5 FOOT LINE / AA. ELECTRICAL

TIME 09:13:10

DETAILED ESTIMATE

DETAIL PAGE 1

BASE BID

DIVISION 16 ELECTRICAL		QUANTITY	UOM	CREW	MANHR	LABOR	EQUIPMENT	MATERIAL	SALESTX	DIRECT \$
16050 BASIC MATERIALS AND METHODS										
16120 1100 SINGLE SOLID CONDUCTOR.										
CD=4 EL 1102	NO. 12 AWG - TYPE THW INSULATION ***	UNIT COSTS: ***		7.14		215.37	0.97	72.72	3.64	292.69
WC=1100	1.08 MLF EELEF			8		233	1	79	4	316
16900 CONTROLS AND INSTRUMENTATION										
16930 2000 PHOTO-CELL, RELAY, LIGHTING ARRESTER, RECEPTACLE AND BRACKET										
CD=3 EL 2003	PHOTOCELL FOR ON/OFF CONTROL	*** UNIT COSTS: ***		0.63		20.63	0.08	600.00	30.00	650.71
WC=1100	BASED ON FOOTCANDLE READING	3.00 EA EELEB		2		62	0	1,800	90	1,952
CD=3 EL 2004	CIRCUIT FOR CONTROL PANEL FOR	*** UNIT COSTS: ***		1.25		41.26	0.16	100.00	5.00	146.42
WC=1100	ON/OFF PHOTOCELL CONTROL	8.00 EA EELEB		10		330	1	800	40	1,171
TOTAL DIVISION 16 ELECTRICAL				20		625	3	2,679	134	3,440
TOTAL FACILITY AA. ELECTRICAL				20		625	3	2,679	134	3,440
TOTAL BID ITEM 1. BUILDING TO THE 5 FOOT LINE				20		625	3	2,679	134	3,440
TOTAL BASE BID				20		625	3	2,679	134	3,440
TOTAL ADDITIVE				0		0	0	0	0	0
TOTAL INCL ADD LIMITED ENERGY STUDY				20		625	3	2,679	134	3,440

\* \* \* END OF DETAIL REPORT \* \* \*

REW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 525331

3-479



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 5253

TIME 09:13:10

PROJECT NOTES

SUMMARY PAGE 1

---

PROJECT NOTES

ECO-3: FACILITY LIGHTING CONTROLS

SCOPE OF WORK: EVALUATE USE OF LIGHTING CONTROLS TO SAVE ENERGY IN  
SELECTED FACILITIES AT FT KNOX.

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 525331

3-480



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 5253

TIME 09:13:10

BID ITEM AND FACILITY SUMMARY

SUMMARY PAGE 2

BID ITEM 1 BUILDING TO THE 5 FOOT LINE

BASE BID

ID	FACILITY		COST TO PRM	OVERHEAD	HOME OFC	PROFIT	BOND	OTHER FCTR	TOTAL COST	UNIT COST
AA	ELECTRICAL			10.0%	0.0%	7.5%	2.5%	0.0%		
		1.00 EA	3,440	344	0	284	102	0	4,169	4169.05
BID ITEM TOTAL		1.00 EA	3,440	344	0	284	102	0	4,169	4169.05
TOTAL BASE BID			3,440	344	0	284	102	0	4,169	
TOTAL ADDITIVE			0	0	0	0	0	0	0	
TOTAL INCL ADD			3,440	344	0	284	102	0	4,169	

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 525331

3-481



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 5253

TIME 09:13:10

PROJECT CWE SUMMARY

SUMMARY PAGE 3

ID	BID ITEM	QUANTITY	UOM	BASE BID	ADDITIVE	TOTAL COST	UNIT COST
	1. BUILDING TO THE 5 FOOT LINE	1.00	EA	4,169		4,169	4169.00
	TOTAL CURRENT CONTRACT COST			4,169	0	4,169	
	Cost Growth from 09/93 to 09/94 Index Values: 0000 0000	0.0%		0	0	0	
	ESCALATED CONTRACT COST			4,169	0	4,169	
	Government-Furnished Property			0		0	
	SUBTOTAL			4,169	0	4,169	
	Contingencies	10.0%		417	0	417	
	SUBTOTAL			4,586	0	4,586	
	SIOH (S&A)	5.0%		229	0	229	
	CURRENT WORKING ESTIMATE			4,815	0	4,815	

Estimated Construction Time 365 Days

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 525331

3-482



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 5253

TIME 09:13:10

CONTRACTOR DIRECT SUMMARY

SUMMARY PAGE 4

ID	CONTRACTOR	PM	QUANTITY	UOM	MANHRS	LABOR	EQUIPMENT	MAT W/TX	** TOTAL DIRECT * AMOUNT PCT	* SUBCON * W/OH&P	SUBTOTAL
AA	GENERAL/PRIME		1.00	EA	20	625	3	2,812	3,440 100.0%	0	3,440
	TOTAL DIRECT				20	625	3	2,812	3,440 100.0%		

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 525331

3-483



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 5253

TIME 09:13:10

CONTRACTOR INDIRECT SUMMARY

SUMMARY PAGE 5

		*** OVERHEAD ***			**** PROFIT ****			***** TOTAL CONTRACT *****					
ID	CONTRACTOR	PM	SUBTOTAL	AMOUNT	PCT	HOFC%	AMOUNT	PCT	BOND%	OTHER%	AMOUNT	PCT	UNIT COST
AA	GENERAL/PRIME		3,440	344	10.0%	0.0	284	7.5%	2.5%	0.0%	4,169	100.0%	4169.04
	TOTAL OVERHEAD & PROFIT			344	10.0%		284	7.5%					

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 525331

3-484



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 5253

TIME 09:13:10

CSI DIVISION SUMMARY

SUMMARY PAGE 6

ID CSI DIVISION	MANHOURS	LABOR	EQUIPMENT	MATERIAL	SALES TAX	***** TOTAL * DIRECT
16 ELECTRICAL	20	625	3	2,679	134	3,440
TOTAL DIRECT	20	625	3	2,679	134	3,440

REW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 525331

3-485



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 5253

TIME 09:13:10

SYSTEMS SUMMARY

SUMMARY PAGE 7

ID SYSTEM	MANHOURS	LABOR	EQUIPMENT	MATERIAL	SALES TAX	***** TOTAL * DIRECT
11 INTERIOR ELECTRICAL	20	625	3	2,679	134	3,440
TOTAL DIRECT	20	625	3	2,679	134	3,440

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 525331

3-486



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 5253

TIME 09:13:10

EQUIPMENT SUMMARY

SUMMARY PAGE 8

----- *** BOOK VALUE ***		ADJ FACTOR		ADJUSTD		BOOK OP --		HRLY ---		UPB		**** TOTAL ****	
EQUIP	DESCRIPTION	LIFE HRS	TL HRLY	OWNRSH	OWNS	OVTM	OWNRSH	EXPENSE	RATE	RATE	HOURS	COST	
EMI20	SMALL TOOLS								1.40	1.40	2	3	
TOTAL PROJECT EQUIPMENT HOURS											2	3	

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 525331

3-487



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 5253

TIME 09:13:10

LABOR SUMMARY

SUMMARY PAGE 9

CRAFT DESCRIPTION	BASE	OVERTM	TXS/INS	FRNG	TRVL	HRLY -- RATE	UPB RATE	**** TOTAL HOURS	**** COST
LELEC ELECTRICIANS	20.50	0.0%	24.0%	7.49	0.00	32.91	25.79	20	625
TOTAL PROJECT MANHOURS								20	625

\* \* \* END OF SUMMARY REPORT \* \* \*

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 525331

3-488



# FORT KNOX LIMITED ENERGY STUDY

ECO 3.1: INSTALL PHOTOCELL LIGHTING CONTROLS TO REDUCE LIGHT LEVELS WHEN POSSIBLE

30 SEPTEMBER 1993

## FACILITY LIGHTING CONTROL INSTALLATION - ON/OFF PHOTOCELLS

BUILDING #: 5256  
BUILDING FUNCTION: AIRPLANE HANGER

BUILDING USE:  
HOURS/DAY 24  
DAYS/WEEK 7

### EXISTING FIXTURE DATA:

LAMP TYPE: METAL HALIDE  
FIXTURE WATTAGE: 1100 WATTS  
NUMBER OF FIXTURES: 48

### ELECTRIC COSTS:

ENERGY CHARGE: \$0.02506 PER KWH  
DEMAND CHARGE: \$7.067 PER KW

### EXISTING LIGHTING CONTROL DATA

0 FIXTS. @ 1.100 KW @ 0% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 1.100 KW @ 10% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 1.100 KW @ 20% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 1.100 KW @ 40% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 1.100 KW @ 60% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 1.100 KW @ 80% OUTPUT \* 0 HR/YR = 0 KWH/YR  
48 FIXTS. @ 1.100 KW @ 100% OUTPUT \* 8,760 HR/YR = 462,528 KWH/YR

TOTAL EXISTING KWH 462,528

### REVISED LIGHTING CONTROL DATA

32 FIXTS. @ 1.100 KW @ 0% OUTPUT \* 2,064 HR/YR = 0 KWH/YR  
0 FIXTS. @ 1.100 KW @ 10% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 1.100 KW @ 20% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 1.100 KW @ 40% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 1.100 KW @ 60% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 1.100 KW @ 80% OUTPUT \* 0 HR/YR = 0 KWH/YR  
48 FIXTS. @ 1.100 KW @ 100% OUTPUT \* 6,896 HR/YR = 353,549 KWH/YR  
16 FIXTS. @ 1.100 KW @ 100% OUTPUT \* 2,064 HR/YR = 36,326 KWH/YR

TOTAL REVISED CONTROL KWH 389,875

NET ENERGY SAVINGS 247.89 MBTU/YR

NET DOLLAR SAVINGS

\$9,913 /YR



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES

TIME 09:20:46

TITLE PAGE

---

LIMITED ENERGY STUDY  
FT KNOX, KY  
ECO-3.1: BUILDING 5256

Contract No: 27-93-C-0096

Prepared By: Systems Corp  
Estimator: Julie A. Hollensbe  
Estimate Prep. Date: 09/30/93  
Current UPB/CSI ID: ORL290

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CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 525631

3-490



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS H-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 5256

TIME 09:20:46

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DETAILED ESTIMATE

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Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS H-CACES  
 LIMITED ENERGY STUDY / FT KNOX, KY  
 ECO-3.1: BUILDING 5256  
 1. BUILDING TO THE 5 FOOT LINE / AA. ELECTRICAL

TIME 09:20:46

DETAILED ESTIMATE

DETAIL PAGE 1

BASE BID

DIVISION 16 ELECTRICAL		QUANTITY	UOM	CREW	MANHR	LABOR	EQUIPMENT	MATERIAL	SALESTX	DIRECT \$
16050 BASIC MATERIALS AND METHODS										
16120 1100 SINGLE SOLID CONDUCTOR.										
CD=4 EL 1102	NO. 12 AWG - TYPE THW INSULATION ***	UNIT COSTS: ***			7.14	215.37	0.97	72.72	3.64	292.69
WC=1100	1.08 MLF EELEF			8		233	1	79	4	316
16900 CONTROLS AND INSTRUMENTATION										
16930 2000 PHOTO-CELL, RELAY, LIGHTING ARRESTER, RECEPTACLE AND BRACKET										
CD=3 EL 2003	PHOTOCELL FOR ON/OFF CONTROL	*** UNIT COSTS: ***			0.63	20.63	0.08	600.00	30.00	650.71
WC=1100	BASED ON FOOTCANDLE READING	3.00 EA EELEB		2		62	0	1,800	90	1,952
CD=3 EL 2004	CIRCUIT FOR CONTROL PANEL FOR	*** UNIT COSTS: ***			1.25	41.26	0.16	100.00	5.00	146.42
WC=1100	ON/OFF PHOTOCELL CONTROL	12.00 EA EELEB		15		495	2	1,200	60	1,757
TOTAL DIVISION 16 ELECTRICAL					25	790	3	3,079	154	4,025
TOTAL FACILITY AA. ELECTRICAL					25	790	3	3,079	154	4,025
TOTAL BID ITEM 1. BUILDING TO THE 5 FOOT LINE					25	790	3	3,079	154	4,025
TOTAL BASE BID					25	790	3	3,079	154	4,025
TOTAL ADDITIVE					0	0	0	0	0	0
TOTAL INCL ADD LIMITED ENERGY STUDY					25	790	3	3,079	154	4,025

\*\*\* END OF DETAIL REPORT \*\*\*

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 525631

3-492



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 5256

TIME 09:20:46

PROJECT NOTES

SUMMARY PAGE 1

---

PROJECT NOTES

ECO-3: FACILITY LIGHTING CONTROLS

SCOPE OF WORK: EVALUATE USE OF LIGHTING CONTROLS TO SAVE ENERGY IN  
SELECTED FACILITIES AT FT KNOX.

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 525631

3-493



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 5256

TIME 09:20:46

BID ITEM AND FACILITY SUMMARY

SUMMARY PAGE 2

BID ITEM 1 BUILDING TO THE 5 FOOT LINE

BASE BID

ID	FACILITY		COST TO PRM	OVERHEAD	HOME OFC	PROFIT	BOND	OTHR FCTR	TOTAL COST	UNIT COST
AA	ELECTRICAL			10.0%	0.0%	7.5%	2.5%	0.0%		
		1.00 EA	4,025	403	0	332	119	0	4,879	4878.95
BID ITEM TOTAL		1.00 EA	4,025	403	0	332	119	0	4,879	4878.95
TOTAL BASE BID			4,025	403	0	332	119	0	4,879	
TOTAL ADDITIVE			0	0	0	0	0	0	0	
TOTAL INCL ADD			4,025	403	0	332	119	0	4,879	

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 525631

3-494



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 5256

TIME 09:20:46

PROJECT CWE SUMMARY

SUMMARY PAGE 3

ID	BID ITEM	QUANTITY	UOM	BASE BID	ADDITIVE	TOTAL COST	UNIT COST
	1. BUILDING TO THE 5 FOOT LINE	1.00	EA	4,879		4,879	4879.00
	TOTAL CURRENT CONTRACT COST			4,879	0	4,879	
	Cost Growth from 09/93 to 09/94 Index Values: 0000 0000	0.0%		0	0	0	
	ESCALATED CONTRACT COST			4,879	0	4,879	
	Government-Furnished Property			0		0	
	SUBTOTAL			4,879	0	4,879	
	Contingencies	10.0%		488	0	488	
	SUBTOTAL			5,367	0	5,367	
	SIOH (S&A)	5.0%		268	0	268	
	CURRENT WORKING ESTIMATE			5,635	0	5,635	
	Estimated Construction Time	365	Days				

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 525631

3-495



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS H-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 5256

TIME 09:20:46

CONTRACTOR DIRECT SUMMARY

SUMMARY PAGE 4

ID	CONTRACTOR	PM	QUANTITY	UOM	MANHRS	LABOR	EQUIPMENT	MAT	W/TX	** TOTAL DIRECT *	** SUBCON *	W/OH&P	SUBTOTAL
										AMOUNT	PCT		
AA	GENERAL/PRIME		1.00	EA	25	790	3	3,232		4,025	100.0%	0	4,025
	TOTAL DIRECT				25	790	3	3,232		4,025	100.0%		

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 525631

3-496



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 5256

TIME 09:20:46

CONTRACTOR INDIRECT SUMMARY

SUMMARY PAGE 5

ID	CONTRACTOR	PM	SUBTOTAL	*** OVERHEAD *** AMOUNT	PCT	HOFC%	**** PROFIT **** AMOUNT	PCT	BOND%	OTHER%	***** TOTAL CONTRACT ***** AMOUNT	PCT	UNIT COST
AA	GENERAL/PRIME		4,025	403	10.0%	0.0	332	7.5%	2.5%	0.0%	4,879	100.0%	4878.94
	TOTAL OVERHEAD & PROFIT			403	10.0%		332	7.5%					

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 525631

3-497



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 5256

TIME 09:20:46

CSI DIVISION SUMMARY

SUMMARY PAGE 6

ID CSI DIVISION	MANHOURS	LABOR	EQUIPMENT	MATERIAL	SALES TAX	***** TOTAL * DIRECT
16 ELECTRICAL	25	790	3	3,079	154	4,025
TOTAL DIRECT	25	790	3	3,079	154	4,025

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 525631

3-498



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 5256

TIME 09:20:46

SYSTEMS SUMMARY

SUMMARY PAGE 7

ID SYSTEM	MANHOURS	LABOR	EQUIPMENT	MATERIAL	SALES TAX	***** TOTAL * DIRECT
11 INTERIOR ELECTRICAL	25	790	3	3,079	154	4,025
TOTAL DIRECT	25	790	3	3,079	154	4,025

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 525631

3-499



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 5256

TIME 09:20:46

EQUIPMENT SUMMARY

SUMMARY PAGE 8

----- *** BOOK VALUE *** ADJ FACTOR ADJUSTD BOOK OP -- HRLY --- UPB **** TOTAL ****											
EQUIP DESCRIPTION	LIFE HRS	TL	HRLY	OWNRSH	OWNS	OVTM	OWNRSH	EXPENSE	RATE	RATE	HOURS COST
EMI20 SMALL TOOLS									1.40	1.40	2 3
TOTAL PROJECT EQUIPMENT HOURS											2 3

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 525631

3-500



Mon 20 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 5256

TIME 09:20:46

LABOR SUMMARY

SUMMARY PAGE 9

CRAFT DESCRIPTION	BASE	OVERTM	TXS/INS	FRNG	TRVL	HRLY RATE	UPB RATE	**** HOURS	TOTAL COST
LELEC ELECTRICIANS	20.50	0.0%	24.0%	7.49	0.00	32.91	25.79	25	790
TOTAL PROJECT MANHOURS								25	790

\* \* \* END OF SUMMARY REPORT \* \* \*

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 525631

3-501



# FORT KNOX LIMITED ENERGY STUDY

ECO 4: IMPROVE BALLFIELD LIGHTING WITH ENERGY EFFICIENCY LIGHTING  
30 SEPTEMBER 1993

## BALLFIELD LIGHTING REPLACEMENT

BALLFIELD #: 2358  
BALLFIELD NAME: GARY OWENS REGIMENT  
ELECTRIC COSTS: ENERGY CHARGE \$0.02506 PER KWH

ESTIMATED HOURS OF OPERATION:  
HOURS/YEAR 1040

### EXISTING FIXTURE DATA

INCANDESCENT  
36 LAMPS @ 1000 WATTS/FIXT = 36,000 WATTS

QUARTZ HALOGEN  
0 LAMPS @ 1500 WATTS/FIXT = 0 WATTS

METAL HALIDE  
0 FIXTURES @ 455 WATTS/FIXT = 0 WATTS  
0 FIXTURES @ 1070 WATTS/FIXT = 0 WATTS

HIGH PRESSURE SODIUM  
0 FIXTURES @ 465 WATTS/FIXT = 0 WATTS

TOTAL EXISTING KWH 37,440  
TOTAL EXISTING MBTU 127,745

### REPLACEMENT FIXTURE DATA

INCANDESCENT  
0 LAMPS @ 1000 WATTS/FIXT = 0 WATTS

QUARTZ HALOGEN  
0 LAMPS @ 1500 WATTS/FIXT = 0 WATTS

METAL HALIDE  
21 FIXTURES @ 455 WATTS/FIXT = 9,555 WATTS  
0 FIXTURES @ 1070 WATTS/FIXT = 0 WATTS

HIGH PRESSURE SODIUM  
0 FIXTURES @ 465 WATTS/FIXT = 0 WATTS

TOTAL REPLACEMENT KWH 9,937  
TOTAL EXISTING MBTU 33,905

NET ENERGY SAVINGS

93,840 MBTU/YR

NET DOLLAR SAVINGS

\$689 /YR



Thu 16 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES

TIME 14:12:57

TITLE PAGE

---

LIMITED ENERGY STUDY  
FT KNOX, KY  
ECO-4: GARY OWENS REGIMENT BALLFIELD #2358

Contract No: 27-93-C-0096

Prepared By: Systems Corp  
Estimator: Julie A. Hollensbe  
Estimate Prep. Date: 09/30/93

Current UPB/CSI ID: ORL290

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CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 2358E4

3-503



Thu 16 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-4: GARY OWENS REGIMENT BALLFIELD #2358

TIME 14:12:57

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DETAILED ESTIMATE

DETAIL PAGE

1. BUILDING TO THE 5 FOOT LINE	
AA. ELECTRICAL.....	1

\* \* \* END TABLE OF CONTENTS \* \* \*



Thu 16 Sep 1993

DETAILED ESTIMATE

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-4: GARY OWENS REGIMENT BALLFIELD #2358  
1. BUILDING TO THE 5 FOOT LINE / AA. ELECTRICAL

TIME 14:12:57

DETAIL PAGE 1

BASE BID

DIVISION 16 ELECTRICAL	QUANTITY	UOM	CREW	MANHR	LABOR	EQUIPMENT	MATERIAL	SALESTX	DIRECT \$
16500 LIGHTING									
16525 2000 METAL HALIDE									
CD=3 EL 2104 400 W MH BALLFIELD FIXTURE W/	*** UNIT COSTS: ***			2.80	84.45	8.32	140.00	7.00	239.77
WC=1100 LAMP	21.00 EA EELEK			59	1,773	175	2,940	147	5,035
TOTAL DIVISION 16 ELECTRICAL				59	1,773	175	2,940	147	5,035
TOTAL FACILITY AA. ELECTRICAL				59	1,773	175	2,940	147	5,035
TOTAL BID ITEM 1. BUILDING TO THE 5 FOOT LINE				59	1,773	175	2,940	147	5,035
TOTAL BASE BID				59	1,773	175	2,940	147	5,035
TOTAL ADDITIVE				0	0	0	0	0	0
TOTAL INCL ADD LIMITED ENERGY STUDY				59	1,773	175	2,940	147	5,035

\*\*\* END OF DETAIL REPORT \*\*\*

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 2358E4

3-505



Thu 16 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-4: GARY OWENS REGIMENT BALLFIELD #2358

TIME 14:12:57

PROJECT NOTES

SUMMARY PAGE 1

---

PROJECT NOTES

ECO-4: ENERGY EFFICIENT LIGHTING

SCOPE OF WORK: EVALUATE USE OF HIGHER EFFICIENCY BALLFIELD LIGHTING IN  
SELECTED AREAS AT FT KNOX.

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 2358E4

3-506



Thu 16 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-4: GARY OWENS REGIMENT BALLFIELD #2358

TIME 14:12:57

BID ITEM AND FACILITY SUMMARY

SUMMARY PAGE 2

BID ITEM 1 BUILDING TO THE 5 FOOT LINE

BASE BID

ID	FACILITY		COST TO PRM	OVERHEAD	HOME OFC	PROFIT	BOND	OTHR FCTR	TOTAL COST	UNIT COST
AA	ELECTRICAL	1.00 EA	5,035	10.0% 504	0.0% 0	7.5% 415	2.5% 149	0.0% 0	6,103	6103.05
<hr/>										
BID ITEM TOTAL		1.00 EA	5,035	504	0	415	149	0	6,103	6103.05
<hr/>										
TOTAL BASE BID			5,035	504	0	415	149	0	6,103	
TOTAL ADDITIVE			0	0	0	0	0	0	0	
<hr/>										
TOTAL INCL ADD			5,035	504	0	415	149	0	6,103	

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 2358E4

3-507



Thu 16 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-4: GARY OWENS REGIMENT BALLFIELD #2358

TIME 14:12:57

PROJECT CWE SUMMARY

SUMMARY PAGE 3

ID	BID ITEM	QUANTITY	UOM	BASE BID	ADDITIVE	TOTAL COST	UNIT COST
1.	BUILDING TO THE 5 FOOT LINE	1.00	EA	6,103		6,103	6103.00
TOTAL CURRENT CONTRACT COST				6,103	0	6,103	
Cost Growth from 09/93 to 09/94 Index Values: 0000 0000		0.0%		0	0	0	
ESCALATED CONTRACT COST				6,103	0	6,103	
Government-Furnished Property				0		0	
SUBTOTAL				6,103	0	6,103	
Contingencies		10.0%		610	0	610	
SUBTOTAL				6,713	0	6,713	
SIOH (S&A)		5.0%		336	0	336	
CURRENT WORKING ESTIMATE				7,049	0	7,049	

Estimated Construction Time 365 Days

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 2358E4

3-508



Thu 16 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-4: GARY OWENS REGIMENT BALLFIELD #2358

TIME 14:12:57

CONTRACTOR DIRECT SUMMARY

SUMMARY PAGE 4

ID	CONTRACTOR	PM	QUANTITY	UOM	MANHRS	LABOR	EQUIPMENT	MAT W/TX	AMOUNT	PCT	W/OH&P	SUBTOTAL
AA	GENERAL/PRIME		1.00	EA	59	1,773	175	3,087	5,035	100.0%	0	5,035
	TOTAL DIRECT				59	1,773	175	3,087	5,035	100.0%		

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 2358E4

3-509



Thu 16 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-4: GARY OWENS REGIMENT BALLFIELD #2358

TIME 14:12:57

CONTRACTOR INDIRECT SUMMARY

SUMMARY PAGE 5

ID	CONTRACTOR	PM	SUBTOTAL	*** OVERHEAD ***	AMOUNT	PCT	HOFC%	**** PROFIT ****	AMOUNT	PCT	BOND%	OTHR%	***** TOTAL CONTRACT *****	AMOUNT	PCT	UNIT COST
AA	GENERAL/PRIME		5,035	504	10.0%	0.0		415	7.5%	2.5%	0.0%		6,103	100.0%		6103.06
	TOTAL OVERHEAD & PROFIT			504	10.0%			415	7.5%							

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 2358E4

3-510



Thu 16 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-4: GARY OWENS REGIMENT BALLFIELD #2358

TIME 14:12:57

CSI DIVISION SUMMARY

SUMMARY PAGE 6

ID CSI DIVISION	MANHOURS	LABOR	EQUIPMENT	MATERIAL	SALES TAX	***** TOTAL * DIRECT
16 ELECTRICAL	59	1,773	175	2,940	147	5,035
TOTAL DIRECT	59	1,773	175	2,940	147	5,035

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 2358E4

3-511



Thu 16 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-4: GARY OWENS REGIMENT BALLFIELD #2358

TIME 14:12:57

SYSTEMS SUMMARY

SUMMARY PAGE 7

ID SYSTEM	MANHOURS	LABOR	EQUIPMENT	MATERIAL	SALES TAX	***** TOTAL * DIRECT
11 INTERIOR ELECTRICAL	59	1,773	175	2,940	147	5,035
TOTAL DIRECT	59	1,773	175	2,940	147	5,035

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 2358E4

3-512



Thu 16 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-4: GARY OWENS REGIMENT BALLFIELD #2358

TIME 14:12:57

EQUIPMENT SUMMARY

SUMMARY PAGE 8

----- *** BOOK VALUE ***		ADJ FACTOR		ADJUSTD		BOOK OP		--	HRLY	---	UPB	****	TOTAL	****
EQUIP	DESCRIPTION	LIFE HRS	TL HRLY	OWNRSH	OWNS	OVTM	OWNRSH	EXPENSE	RATE		RATE	HOURS		COST
EMI20	SMALL TOOLS								1.40		1.40	6		8
ETR90	LINE TRUCK								19.86		19.86	8		167
TOTAL PROJECT EQUIPMENT HOURS												14		175

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 2358E4

3-513



Thu 16 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-4: GARY OWENS REGIMENT BALLFIELD #2358

TIME 14:12:57

LABOR SUMMARY

SUMMARY PAGE 9

CRAFT DESCRIPTION	BASE	OVERTM	TXS/INS	FRNG	TRVL	HRLY RATE	UPB RATE	**** HOURS	TOTAL COST
LELEC ELECTRICIANS	20.50	0.0%	24.0%	7.49	0.00	32.91	25.79	59	1,773
TOTAL PROJECT MANHOURS								59	1,773

\* \* \* END OF SUMMARY REPORT \* \* \*

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 2358E4

3-514



# FORT KNOX LIMITED ENERGY STUDY

ECO 4: IMPROVE BALLFIELD LIGHTING WITH ENERGY EFFICIENCY LIGHTING

30 SEPTEMBER 1993

## BALLFIELD LIGHTING REPLACEMENT

BALLFIELD #: 2386 NORTH  
 BALLFIELD NAME: BLACK HORSE/HELL ON WHEELS  
 ELECTRIC COSTS:  
 ENERGY CHARGE \$0.02506 PER KWH

ESTIMATED HOURS OF OPERATION:  
 HOURS/YEAR 1040

### EXISTING FIXTURE DATA

INCANDESCENT  
 0 LAMPS @ 1000 WATTS/FIXT = 0 WATTS

QUARTZ HALOGEN  
 29 LAMPS @ 1500 WATTS/FIXT = 43,500 WATTS

METAL HALIDE  
 0 FIXTURES @ 455 WATTS/FIXT = 0 WATTS

0 FIXTURES @ 1070 WATTS/FIXT = 0 WATTS

HIGH PRESSURE SODIUM  
 0 FIXTURES @ 465 WATTS/FIXT = 0 WATTS

TOTAL EXISTING KWH 45,240  
 TOTAL EXISTING MBTU 154,360

### REPLACEMENT FIXTURE DATA

INCANDESCENT  
 0 LAMPS @ 1000 WATTS/FIXT = 0 WATTS

QUARTZ HALOGEN  
 0 LAMPS @ 1500 WATTS/FIXT = 0 WATTS

METAL HALIDE  
 0 FIXTURES @ 455 WATTS/FIXT = 0 WATTS

10 FIXTURES @ 1070 WATTS/FIXT = 10,700 WATTS

HIGH PRESSURE SODIUM  
 0 FIXTURES @ 465 WATTS/FIXT = 0 WATTS

TOTAL REPLACEMENT KWH 11,128  
 TOTAL EXISTING MBTU 37,970

NET ENERGY SAVINGS 116,390 MBTU/YR

NET DOLLAR SAVINGS

\$855/YR



Thu 16 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES

TIME 13:33:38

TITLE PAGE

---

LIMITED ENERGY STUDY  
FT KNOX, KY  
ECO-4: BLACK HORSE/HELL ON WHEELS FIELD #2388N

Contract No: 27-93-C-0096

Prepared By: Systems Corp  
Estimator: Julie A. Hollensbe  
Estimate Prep. Date: 09/30/93  
Current UPB/CSI ID: ORL290

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CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 2388N4

3-516



Thu 16 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-4: BLACK HORSE/HELL ON WHEELS FIELD #2388N

TIME 13:33:38

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DETAILED ESTIMATE

DETAIL PAGE

1. BUILDING TO THE 5 FOOT LINE	
AA. ELECTRICAL.....	1

\* \* \* END TABLE OF CONTENTS \* \* \*



Thu 16 Sep 1993

DETAILED ESTIMATE

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-4: BLACK HORSE/HELL ON WHEELS FIELD #2388N  
1. BUILDING TO THE 5 FOOT LINE / AA. ELECTRICAL

TIME 13:33:38

DETAIL PAGE 1

BASE BID

DIVISION 16 ELECTRICAL	QUANTITY	UOM	CREW	MANHR	LABOR	EQUIPMENT	MATERIAL	SALESTX	DIRECT \$
16500 LIGHTING									
16525 2000 METAL HALIDE									
CD=3 EL 2105 1000 W MH BALLFIELD FIXTURE W/ WC=1100 LAMP	*** UNIT COSTS: ***			2.80	84.45	8.32	175.00	8.75	276.52
	10.00 EA EELEK			28	844	83	1,750	88	2,765
TOTAL DIVISION 16 ELECTRICAL				28	844	83	1,750	88	2,765
TOTAL FACILITY AA. ELECTRICAL				28	844	83	1,750	88	2,765
TOTAL BID ITEM 1. BUILDING TO THE 5 FOOT LINE				28	844	83	1,750	88	2,765
TOTAL BASE BID				28	844	83	1,750	88	2,765
TOTAL ADDITIVE				0	0	0	0	0	0
TOTAL INCL ADD LIMITED ENERGY STUDY				28	844	83	1,750	88	2,765

\* \* \* END OF DETAIL REPORT \* \* \*

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 2388N4

3-518



Thu 16 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-4: BLACK HORSE/HELL ON WHEELS FIELD #2388N

TIME 14:08:39

PROJECT NOTES

SUMMARY PAGE 1

---

PROJECT NOTES

ECO-4: ENERGY EFFICIENT LIGHTING

SCOPE OF WORK: EVALUATE USE OF HIGHER EFFICIENCY BALLFIELD LIGHTING IN  
SELECTED AREAS AT FT KNOX.

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 2388N4

3-519



Thu 16 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-4: BLACK HORSE/HELL ON WHEELS FIELD #2388N

TIME 13:33:33

BID ITEM AND FACILITY SUMMARY

SUMMARY PAGE 2

BID ITEM 1 BUILDING TO THE 5 FOOT LINE

BASE BID

ID	FACILITY		COST TO PRM	OVERHEAD	HOME OFC	PROFIT	BOND	OTHR FCTR	TOTAL COST	UNIT COST
AA	ELECTRICAL			10.0%	0.0%	7.5%	2.5%	0.0%		
		1.00 EA	2,765	277	0	228	82	0	3,352	3351.66
BID ITEM TOTAL		1.00 EA	2,765	277	0	228	82	0	3,352	3351.66
TOTAL BASE BID			2,765	277	0	228	82	0	3,352	
TOTAL ADDITIVE			0	0	0	0	0	0	0	
TOTAL INCL ADD			2,765	277	0	228	82	0	3,352	

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 2388N4

3-520



Thu 16 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
 LIMITED ENERGY STUDY / FT KNOX, KY  
 ECO-4: BLACK HORSE/HELL ON WHEELS FIELD #2388N

TIME 13:33:38

PROJECT CWE SUMMARY

SUMMARY PAGE 3

ID	BID ITEM	QUANTITY UOM	BASE BID	ADDITIVE	TOTAL COST	UNIT COST
1.	BUILDING TO THE 5 FOOT LINE	1.00 EA	3,352		3,352	3351.70
	TOTAL CURRENT CONTRACT COST		3,352	0	3,352	
	Cost Growth from 09/93 to 09/94 Index Values: 0000 0000	0.0%	0	0	0	
	ESCALATED CONTRACT COST		3,352	0	3,352	
	Government-Furnished Property		0		0	
	SUBTOTAL		3,352	0	3,352	
	Contingencies	10.0%	335	0	335	
	SUBTOTAL		3,687	0	3,687	
	SIOH (S&A)	5.0%	184	0	184	
	CURRENT WORKING ESTIMATE		3,871	0	3,871	
	Estimated Construction Time	365 Days				

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 2388N4

3-521



Thu 16 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-4: BLACK HORSE/HELL ON WHEELS FIELD #2388N

TIME 13:33:38

CONTRACTOR DIRECT SUMMARY

SUMMARY PAGE 4

ID	CONTRACTOR	PM	QUANTITY	UOM	MANHRS	LABOR	EQUIPMENT	MAT W/TX	AMOUNT	PCT	W/OH&P	SUBTOTAL
AA	GENERAL/PRIME		1.00	EA	28	844	83	1,838	2,765	100.0%	0	2,765
	TOTAL DIRECT				28	844	83	1,838	2,765	100.0%		

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 2388N4

3-522



Thu 16 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-4: BLACK HORSE/HELL ON WHEELS FIELD #2388N

TIME 13:33:38

CONTRACTOR INDIRECT SUMMARY

SUMMARY PAGE 5

ID	CONTRACTOR	PM	SUBTOTAL	*** OVERHEAD *** AMOUNT	PCT	HOFC%	**** PROFIT **** AMOUNT	PCT	BOND%	OTHR%	***** TOTAL CONTRACT ***** AMOUNT	PCT	UNIT COST
AA	GENERAL/PRIME		2,765	277	10.0%	0.0	228	7.5%	2.5%	0.0%	3,352	100.0%	3351.65
	TOTAL OVERHEAD & PROFIT			277	10.0%		228	7.5%			-		

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 2388N4

3-523



Thu 16 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-4: BLACK HORSE/HELL ON WHEELS FIELD #2388N

TIME 13:33:33

CSI DIVISION SUMMARY

SUMMARY PAGE 6

ID CSI DIVISION	MANHOURS	LABOR	EQUIPMENT	MATERIAL	SALES TAX	***** TOTAL * DIRECT
16 ELECTRICAL	28	844	83	1,750	88	2,765
TOTAL DIRECT	28	844	83	1,750	88	2,765

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 2388N4

3-524



Thu 16 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-4: BLACK HORSE/HELL ON WHEELS FIELD #2388N

TIME 13:33:38

SYSTEMS SUMMARY

SUMMARY PAGE 7

ID SYSTEM	MANHOURS	LABOR	EQUIPMENT	MATERIAL	SALES TAX	***** TOTAL * DIRECT
11 INTERIOR ELECTRICAL	28	844	83	1,750	88	2,765
TOTAL DIRECT	28	844	83	1,750	88	2,765

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 2388N4

3-525



Thu 16 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-4: BLACK HORSE/HELL ON WHEELS FIELD #2388N

TIME 13:33:38

EQUIPMENT SUMMARY

SUMMARY PAGE 8

----- *** BOOK VALUE ***		ADJ FACTOR		ADJUSTD		BOOK OP		--	HRLY	---	UPB	****	TOTAL	****
EQUIP	DESCRIPTION	LIFE HRS	TL	HRLY	OWNRSH	OWNS	OVTH	OWNRSH	EXPENSE	RATE	RATE	HOURS	COST	
EMI20	SMALL TOOLS									1.40	1.40	3	4	
ETR90	LINE TRUCK									19.86	19.86	4	79	
												7	83	
TOTAL PROJECT EQUIPMENT HOURS														

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 2388N4

3-526



Thu 16 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-4: BLACK HORSE/HELL ON WHEELS FIELD #2388N

TIME 13:33:38

LABOR SUMMARY

SUMMARY PAGE 9

CRAFT DESCRIPTION	BASE	OVERTM	TXS/INS	FRNG	TRVL	HRLY RATE	UPB RATE	**** TOTAL **** HOURS	COST
LELEC ELECTRICIANS	20.50	0.0%	24.0%	7.49	0.00	32.91	25.79	28	845
TOTAL PROJECT MANHOURS								28	845

\* \* \* END OF SUMMARY REPORT \* \* \*

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 2388N4

3-527



# FORT KNOX LIMITED ENERGY STUDY

ECO 4: IMPROVE BALLFIELD LIGHTING WITH ENERGY EFFICIENCY LIGHTING  
30 SEPTEMBER 1993

## BALLFIELD LIGHTING REPLACEMENT

BALLFIELD #: 2388 SOUTH  
 BALLFIELD NAME: BLACK HORSE/HELL ON WHEELS  
 ELECTRIC COSTS: ENERGY CHARGE \$0.02506 PER KWH

ESTIMATED HOURS OF OPERATION:  
 HOURS/YEAR 1040

### EXISTING FIXTURE DATA

INCANDESCENT  
 0 LAMPS @ 1000 WATTS/FIXT = 0 WATTS

QUARTZ HALOGEN  
 28 LAMPS @ 1500 WATTS/FIXT = 42,000 WATTS

METAL HALIDE  
 0 FIXTURES @ 455 WATTS/FIXT = 0 WATTS

0 FIXTURES @ 1070 WATTS/FIXT = 0 WATTS

HIGH PRESSURE SODIUM  
 0 FIXTURES @ 465 WATTS/FIXT = 0 WATTS

TOTAL EXISTING KWH 43,680  
 TOTAL EXISTING MBTU 149,040

### REPLACEMENT FIXTURE DATA

INCANDESCENT  
 0 LAMPS @ 1000 WATTS/FIXT = 0 WATTS

QUARTZ HALOGEN  
 0 LAMPS @ 1500 WATTS/FIXT = 0 WATTS

METAL HALIDE  
 0 FIXTURES @ 455 WATTS/FIXT = 0 WATTS

9 FIXTURES @ 1070 WATTS/FIXT = 9,630 WATTS

HIGH PRESSURE SODIUM  
 0 FIXTURES @ 465 WATTS/FIXT = 0 WATTS

TOTAL REPLACEMENT KWH 10,015  
 TOTAL EXISTING MBTU 34,170

NET ENERGY SAVINGS 114,870 MBTU/YR NET DOLLAR SAVINGS \$844 /YR



Thu 16 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES

TIME 13:46:42

TITLE PAGE

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LIMITED ENERGY STUDY  
FT KNOX, KY  
ECO-4: BLACK HORSE/HELL ON WHEELS FIELD #2388S

Contract No: 27-93-C-0096

Prepared By: Systems Corp  
Estimator: Julie A. Hollensbe  
Estimate Prep. Date: 09/30/93

Current UPB/CSI ID: ORL290

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Release 4.20

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 2388S4

3-529



Thu 16 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-4: BLACK HORSE/HELL ON WHEELS FIELD #2388S

TIME 13:46:42

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DETAILED ESTIMATE	DETAIL PAGE
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1. BUILDING TO THE 5 FOOT LINE	
AA. ELECTRICAL.....	1

\* \* \* END TABLE OF CONTENTS \* \* \*



Thu 16 Sep 1993

DETAILED ESTIMATE

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-4: BLACK HORSE/HELL ON WHEELS FIELD #2388S  
1. BUILDING TO THE 5 FOOT LINE / AA. ELECTRICAL

TIME 13:46:42

DETAIL PAGE 1

BASE BID

DIVISION 16 ELECTRICAL	QUANTITY	UOM	CREW	MANHR	LABOR	EQUIPMENT	MATERIAL	SALESTX	DIRECT \$
16500 LIGHTING									
16525 2000 METAL HALIDE									
CD=3 EL 2105 1000 W MH BALLFIELD FIXTURE W/	***	UNIT COSTS: ***		2.80	84.45	8.32	175.00	8.75	276.52
WC=1100 LAMP	9.00	EA EELEK		25	760	75	1,575	79	2,489
TOTAL DIVISION 16 ELECTRICAL				25	760	75	1,575	79	2,489
TOTAL FACILITY AA. ELECTRICAL				25	760	75	1,575	79	2,489
TOTAL BID ITEM 1. BUILDING TO THE 5 FOOT LINE				25	760	75	1,575	79	2,489
TOTAL BASE BID				25	760	75	1,575	79	2,489
TOTAL ADDITIVE				0	0	0	0	0	0
TOTAL INCL ADD LIMITED ENERGY STUDY				25	760	75	1,575	79	2,489

\*\*\* END OF DETAIL REPORT \*\*\*

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 2388S4

3-531



Thu 16 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-4: BLACK HORSE/HELL ON WHEELS FIELD #2388S

TIME 14:04:39

PROJECT NOTES

SUMMARY PAGE 1

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PROJECT NOTES

ECO-4: ENERGY EFFICIENT LIGHTING

SCOPE OF WORK: EVALUATE USE OF HIGHER EFFICIENCY BALLFIELD LIGHTING IN  
SELECTED AREAS AT FT KNOX.

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 2388S4

3-532



Thu 16 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-4: BLACK HORSE/HELL ON WHEELS FIELD #2388S

TIME 13:46:42

BID ITEM AND FACILITY SUMMARY

SUMMARY PAGE 2

BID ITEM 1 BUILDING TO THE 5 FOOT LINE

BASE BID

ID	FACILITY		COST TO PRM	OVERHEAD	HOME OFC	PROFIT	BOND	OTHR FCTR	TOTAL COST	UNIT COST	
AA	ELECTRICAL	1.00 EA	2,489	10.0% 249	0.0% 0	7.5% 205	2.5% 74	0.0% 0	3,016	3016.48	
BID ITEM TOTAL			1.00 EA	2,489	249	0	205	74	0	3,016	3016.48
TOTAL BASE BID				2,489	249	0	205	74	0	3,016	
TOTAL ADDITIVE				0	0	0	0	0	0	0	
TOTAL INCL ADD				2,489	249	0	205	74	0	3,016	

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 2388S4

3-533



Thu 16 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
 LIMITED ENERGY STUDY / FT KNOX, KY  
 ECO-4: BLACK HORSE/HELL ON WHEELS FIELD #2388S

TIME 13:46:42

PROJECT CWE SUMMARY

SUMMARY PAGE 3

ID	BID ITEM	QUANTITY UOM	BASE BID	ADDITIVE	TOTAL COST	UNIT COST
1.	BUILDING TO THE 5 FOOT LINE	1.00 EA	3,017		3,017	3016.50
	TOTAL CURRENT CONTRACT COST		3,017	0	3,017	
	Cost Growth from 09/93 to 09/94 Index Values: 0000 0000	0.0%	0	0	0	
	ESCALATED CONTRACT COST		3,017	0	3,017	
	Government-Furnished Property		0		0	
	SUBTOTAL		3,017	0	3,017	
	Contingencies	10.0%	302	0	302	
	SUBTOTAL		3,318	0	3,318	
	SIOH (S&A)	5.0%	166	0	166	
	CURRENT WORKING ESTIMATE		3,484	0	3,484	

Estimated Construction Time 365 Days

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 2388S4

3-534



Thu 16 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-4: BLACK HORSE/HELL ON WHEELS FIELD #2388S

TIME 13:46:42

CONTRACTOR DIRECT SUMMARY

SUMMARY PAGE 4

ID	CONTRACTOR	PM	QUANTITY	UOM	MANHRS	LABOR	EQUIPMENT	MAT W/TX	AMOUNT	PCT	W/OH&P	SUBTOTAL
AA	GENERAL/PRIME		1.00	EA	25	760	75	1,654	2,489	100.0%	0	2,489
	TOTAL DIRECT				25	760	75	1,654	2,489	100.0%		

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 2388S4

3-535



Thu 16 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-4: BLACK HORSE/HELL ON WHEELS FIELD #2388S

TIME 13:46:42

CONTRACTOR INDIRECT SUMMARY

SUMMARY PAGE 5

ID	CONTRACTOR	PM	SUBTOTAL	*** OVERHEAD *** AMOUNT	PCT	HOFC%	**** PROFIT **** AMOUNT	PCT	BOND%	OTHER%	***** TOTAL CONTRACT ***** AMOUNT	PCT	UNIT COST
AA	GENERAL/PRIME		2,489	249	10.0%	0.0	205	7.5%	2.5%	0.0%	3,016	100.0%	3016.48
	TOTAL OVERHEAD & PROFIT			249	10.0%		205	7.5%					

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 2388S4

3-536



Thu 16 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-4: BLACK HORSE/HELL ON WHEELS FIELD #2388S

TIME 13:46:42

CSI DIVISION SUMMARY

SUMMARY PAGE 6

ID CSI DIVISION	MANHOURS	LABOR	EQUIPMENT	MATERIAL	SALES TAX	***** TOTAL * DIRECT
16 ELECTRICAL	25	760	75	1,575	79	2,489
TOTAL DIRECT	25	760	75	1,575	79	2,489

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 2388S4

3-537



Thu 16 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-4: BLACK HORSE/HELL ON WHEELS FIELD #2388S

TIME 13:46:42

SYSTEMS SUMMARY

SUMMARY PAGE 7

ID SYSTEM	MANHOURS	LABOR	EQUIPMENT	MATERIAL	SALES TAX	***** TOTAL * DIRECT
11 INTERIOR ELECTRICAL	25	760	75	1,575	79	2,489
TOTAL DIRECT	25	760	75	1,575	79	2,489

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 2388S4

3-538



Thu 16 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-4: BLACK HORSE/HELL ON WHEELS FIELD #2388S

TIME 13:46:42

EQUIPMENT SUMMARY

SUMMARY PAGE 8

----- *** BOOK VALUE ***		ADJ FACTOR	ADJUSTD	BOOK OP	--	HRLY	---	UPB	****	TOTAL	****	
EQUIP	DESCRIPTION	LIFE HRS	TL HRLY	OWNRSH	OWNS	OVTM	OWNRSH	EXPENSE	RATE	RATE	HOURS	COST
EMI20	SMALL TOOLS								1.40	1.40	2	3
ETR90	LINE TRUCK								19.86	19.86	4	72
											-----	-----
TOTAL PROJECT EQUIPMENT HOURS											6	75

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 2388S4

3-539



Thu 16 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-4: BLACK HORSE/HELL ON WHEELS FIELD #2388S

TIME 13:46:42

LABOR SUMMARY

SUMMARY PAGE 9

CRAFT DESCRIPTION	BASE	OVERTM	TXS/INS	FRNG	TRVL	HRLY RATE	UPB RATE	**** HOURS	TOTAL COST
LELEC ELECTRICIANS	20.50	0.0%	24.0%	7.49	0.00	32.91	25.79	25	760
TOTAL PROJECT MANHOURS								25	760

\* \* \* END OF SUMMARY REPORT \* \* \*

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 2388S4

3-540



# FORT KNOX LIMITED ENERGY STUDY

ECO 4.2: INSTALL LIGHTING CONTROLS ON BALLFIELD LIGHTING SYSTEM  
30 SEPTEMBER 1993

## FACILITY LIGHTING REPLACEMENT

BALLFIELD #: 2358  
BALLFIELD LOCATION: GARY OWENS REGIMENT  
CURRENT ESTIMATED HOURS OF OPERATION: 1040  
HOURS/YEAR

ELECTRIC COSTS:  
ENERGY CHARGE \$0.02506 PER KWH  
REVISED ESTIMATED HOURS OF OPERATION: 884  
HOURS/YEAR

### EXISTING CONTROL DATA

INCANDESCENT  
0 LAMPS @ 1000 WATTS/FIXT = 0 WATTS

QUARTZ HALOGEN  
0 LAMPS @ 1500 WATTS/FIXT = 0 WATTS

METAL HALIDE  
21 FIXTURES @ 455 WATTS/FIXT = 9,555 WATTS  
0 FIXTURES @ 1070 WATTS/FIXT = 0 WATTS  
0 FIXTURES @ 1610 WATTS/FIXT = 0 WATTS

HIGH PRESSURE SODIUM  
0 FIXTURES @ 465 WATTS/FIXT = 0 WATTS

TOTAL EXISTING KWH 9,937

### REPLACEMENT CONTROL DATA

INCANDESCENT  
0 LAMPS @ 1000 WATTS/FIXT = 0 WATTS

QUARTZ HALOGEN  
0 LAMPS @ 1500 WATTS/FIXT = 0 WATTS

METAL HALIDE  
21 FIXTURES @ 455 WATTS/FIXT = 9,555 WATTS  
0 FIXTURES @ 1070 WATTS/FIXT = 0 WATTS  
0 FIXTURES @ 1610 WATTS/FIXT = 0 WATTS

HIGH PRESSURE SODIUM  
0 FIXTURES @ 465 WATTS/FIXT = 0 WATTS

TOTAL REPLACEMENT KWH 8,447

NET ENERGY SAVINGS 5.084 MBTU/YR

NET DOLLAR SAVINGS \$37.34



# FORT KNOX LIMITED ENERGY STUDY

ECO 4.2: INSTALL LIGHTING CONTROLS ON BALLFIELD LIGHTING SYSTEM  
30 SEPTEMBER 1993

## FACILITY LIGHTING REPLACEMENT

BALLFIELD #: 2388 NORTH  
 BALLFIELD LOCATION: BLACK HORSE/HELL ON WHEELS  
 CURRENT ESTIMATED HOURS OF OPERATION: 1040 HOURS/YEAR  
 ELECTRIC COSTS:  
 ENERGY CHARGE \$0.02506 PER KWH  
 REVISED ESTIMATED HOURS OF OPERATION: 884 HOURS/YEAR

### EXISTING CONTROL DATA

INCANDESCENT  
 0 LAMPS @ 1000 WATTS/FIXT = 0 WATTS  
 QUARTZ HALOGEN  
 0 LAMPS @ 1500 WATTS/FIXT = 0 WATTS  
 METAL HALIDE  
 0 FIXTURES @ 455 WATTS/FIXT = 0 WATTS  
 10 FIXTURES @ 1070 WATTS/FIXT = 10,700 WATTS  
 0 FIXTURES @ 1610 WATTS/FIXT = 0 WATTS  
 HIGH PRESSURE SODIUM  
 0 FIXTURES @ 465 WATTS/FIXT = 0 WATTS

TOTAL EXISTING KWH

11,128

### REPLACEMENT CONTROL DATA

INCANDESCENT  
 0 LAMPS @ 1000 WATTS/FIXT = 0 WATTS  
 QUARTZ HALOGEN  
 0 LAMPS @ 1500 WATTS/FIXT = 0 WATTS  
 METAL HALIDE  
 0 FIXTURES @ 455 WATTS/FIXT = 0 WATTS  
 10 FIXTURES @ 1070 WATTS/FIXT = 10,700 WATTS  
 0 FIXTURES @ 1610 WATTS/FIXT = 0 WATTS  
 HIGH PRESSURE SODIUM  
 0 FIXTURES @ 465 WATTS/FIXT = 0 WATTS

TOTAL REPLACEMENT KWH

9,459

NET ENERGY SAVINGS

5.695 MBTU/YR

NET DOLLAR SAVINGS

\$41.83



# FORT KNOX LIMITED ENERGY STUDY

ECO 4.2: INSTALL LIGHTING CONTROLS ON BALLFIELD LIGHTING SYSTEM  
30 SEPTEMBER 1993

## FACILITY LIGHTING REPLACEMENT

BALLFIELD #: 2388 SOUTH  
 BALLFIELD LOCATION: BLACK HORSE/HELL ON WHEELS  
 CURRENT ESTIMATED HOURS OF OPERATION: 1040  
 HOURS/YEAR  
 ELECTRIC COSTS:  
 ENERGY CHARGE \$0.02506 PER KWH  
 REVISED ESTIMATED HOURS OF OPERATION: 884  
 HOURS/YEAR

### EXISTING CONTROL DATA

INCANDESCENT  
 0 LAMPS @ 1000 WATTS/FIXT = 0 WATTS  
 QUARTZ HALOGEN  
 0 LAMPS @ 1500 WATTS/FIXT = 0 WATTS  
 METAL HALIDE  
 0 FIXTURES @ 455 WATTS/FIXT = 0 WATTS  
 9 FIXTURES @ 1070 WATTS/FIXT = 9,630 WATTS  
 0 FIXTURES @ 1610 WATTS/FIXT = 0 WATTS  
 HIGH PRESSURE SODIUM  
 0 FIXTURES @ 465 WATTS/FIXT = 0 WATTS

TOTAL EXISTING KWH 10,015

### REPLACEMENT CONTROL DATA

INCANDESCENT  
 0 LAMPS @ 1000 WATTS/FIXT = 0 WATTS  
 QUARTZ HALOGEN  
 0 LAMPS @ 1500 WATTS/FIXT = 0 WATTS  
 METAL HALIDE  
 0 FIXTURES @ 455 WATTS/FIXT = 0 WATTS  
 9 FIXTURES @ 1070 WATTS/FIXT = 9,630 WATTS  
 0 FIXTURES @ 1610 WATTS/FIXT = 0 WATTS  
 HIGH PRESSURE SODIUM  
 0 FIXTURES @ 465 WATTS/FIXT = 0 WATTS

TOTAL REPLACEMENT KWH 8,513

NET ENERGY SAVINGS

5.125 MBTU/YR

NET DOLLAR SAVINGS

\$37.64



# FORT KNOX LIMITED ENERGY STUDY

ECO 4.2: INSTALL LIGHTING CONTROLS ON BALLFIELD LIGHTING SYSTEM

30 SEPTEMBER 1993

## FACILITY LIGHTING REPLACEMENT

BALLFIELD #: 4557  
BALLFIELD LOCATION: KEYS PARK

ELECTRIC COSTS:  
ENERGY CHARGE \$0.02506 PER KWH

CURRENT ESTIMATED HOURS OF OPERATION:  
HOURS/YEAR 1040

REVISED ESTIMATED HOURS OF OPERATION:  
HOURS/YEAR 884

### EXISTING CONTROL DATA

INCANDESCENT  
0 LAMPS @ 1000 WATTS/FIXT = 0 WATTS

QUARTZ HALOGEN  
0 LAMPS @ 1500 WATTS/FIXT = 0 WATTS

METAL HALIDE  
0 FIXTURES @ 455 WATTS/FIXT = 0 WATTS

0 FIXTURES @ 1070 WATTS/FIXT = 0 WATTS

26 FIXTURES @ 1610 WATTS/FIXT = 41,860 WATTS

HIGH PRESSURE SODIUM  
0 FIXTURES @ 465 WATTS/FIXT = 0 WATTS

TOTAL EXISTING KWH

49,534

### REPLACEMENT CONTROL DATA

INCANDESCENT  
0 LAMPS @ 1000 WATTS/FIXT = 0 WATTS

QUARTZ HALOGEN  
0 LAMPS @ 1500 WATTS/FIXT = 0 WATTS

METAL HALIDE  
0 FIXTURES @ 455 WATTS/FIXT = 0 WATTS

0 FIXTURES @ 1070 WATTS/FIXT = 0 WATTS

26 FIXTURES @ 1610 WATTS/FIXT = 41,860 WATTS

HIGH PRESSURE SODIUM  
0 FIXTURES @ 465 WATTS/FIXT = 0 WATTS

TOTAL REPLACEMENT KWH

37,004

NET ENERGY SAVINGS

22,280 MBTU/YR

NET DOLLAR SAVINGS

\$163.64



# FORT KNOX LIMITED ENERGY STUDY

ECO 4.2: INSTALL LIGHTING CONTROLS ON BALLFIELD LIGHTING SYSTEM

30 SEPTEMBER 1993

## FACILITY LIGHTING REPLACEMENT

BALLFIELD #: 5913

BALLFIELD LOCATION: DISNEY AREA

### ELECTRIC COSTS:

ENERGY CHARGE \$0.02506 PER KWH

CURRENT ESTIMATED HOURS OF OPERATION:

HOURS/YEAR 1040

REVISED ESTIMATED HOURS OF OPERATION:

HOURS/YEAR 884

### EXISTING CONTROL DATA

INCANDESCENT  
0 LAMPS @ 1000 WATTS/FIXT = 0 WATTS

QUARTZ HALOGEN  
0 LAMPS @ 1500 WATTS/FIXT = 0 WATTS

METAL HALIDE  
0 FIXTURES @ 455 WATTS/FIXT = 0 WATTS

39 FIXTURES @ 1070 WATTS/FIXT = 41,730 WATTS

0 FIXTURES @ 1610 WATTS/FIXT = 0 WATTS

HIGH PRESSURE SODIUM  
0 FIXTURES @ 465 WATTS/FIXT = 0 WATTS

TOTAL EXISTING KWH

43,399

### REPLACEMENT CONTROL DATA

INCANDESCENT  
0 LAMPS @ 1000 WATTS/FIXT = 0 WATTS

QUARTZ HALOGEN  
0 LAMPS @ 1500 WATTS/FIXT = 0 WATTS

METAL HALIDE  
0 FIXTURES @ 455 WATTS/FIXT = 0 WATTS

39 FIXTURES @ 1070 WATTS/FIXT = 41,730 WATTS

0 FIXTURES @ 1610 WATTS/FIXT = 0 WATTS

HIGH PRESSURE SODIUM  
0 FIXTURES @ 465 WATTS/FIXT = 0 WATTS

TOTAL REPLACEMENT KWH

36,889

NET ENERGY SAVINGS

22,212 MBTU/YR

NET DOLLAR SAVINGS

\$163.14



# FORT KNOX LIMITED ENERGY STUDY

ECO 4.2: INSTALL LIGHTING CONTROLS ON BALLFIELD LIGHTING SYSTEM

30 SEPTEMBER 1993

## FACILITY LIGHTING REPLACEMENT

BALLFIELD #: 6532  
BALLFIELD LOCATION: 2ND DRAGON/BACHLER

ELECTRIC COSTS:  
ENERGY CHARGE \$0.02506 PER KWH

CURRENT ESTIMATED HOURS OF OPERATION:  
HOURS/YEAR 1040

REVISED ESTIMATED HOURS OF OPERATION:  
HOURS/YEAR 884

### EXISTING CONTROL DATA

INCANDESCENT  
0 LAMPS @ 1000 WATTS/FIXT = 0 WATTS

QUARTZ HALOGEN  
0 LAMPS @ 1500 WATTS/FIXT = 0 WATTS

METAL HALIDE  
0 FIXTURES @ 455 WATTS/FIXT = 0 WATTS

28 FIXTURES @ 1070 WATTS/FIXT = 29,960 WATTS

0 FIXTURES @ 1610 WATTS/FIXT = 0 WATTS

HIGH PRESSURE SODIUM  
0 FIXTURES @ 465 WATTS/FIXT = 0 WATTS

TOTAL EXISTING KWH

31,158

### REPLACEMENT CONTROL DATA

INCANDESCENT  
0 LAMPS @ 1000 WATTS/FIXT = 0 WATTS

QUARTZ HALOGEN  
0 LAMPS @ 1500 WATTS/FIXT = 0 WATTS

METAL HALIDE  
0 FIXTURES @ 455 WATTS/FIXT = 0 WATTS

28 FIXTURES @ 1070 WATTS/FIXT = 29,960 WATTS

0 FIXTURES @ 1610 WATTS/FIXT = 0 WATTS

HIGH PRESSURE SODIUM  
0 FIXTURES @ 465 WATTS/FIXT = 0 WATTS

TOTAL REPLACEMENT KWH

26,485

NET ENERGY SAVINGS

15,944 MBTU/YR

NET DOLLAR SAVINGS

\$117.11



# FORT KNOX LIMITED ENERGY STUDY

ECO 4.2: INSTALL LIGHTING CONTROLS ON BALLFIELD LIGHTING SYSTEM

30 SEPTEMBER 1993

## FACILITY LIGHTING REPLACEMENT

BALLFIELD #: 6609  
BALLFIELD LOCATION: TURRETT FIELD

ELECTRIC COSTS:  
ENERGY CHARGE \$0.02506 PER KWH

CURRENT ESTIMATED HOURS OF OPERATION:  
HOURS/YEAR 1040

REVISED ESTIMATED HOURS OF OPERATION:  
HOURS/YEAR 884

### EXISTING CONTROL DATA

INCANDESCENT  
0 LAMPS @ 1000 WATTS/FIXT = 0 WATTS

QUARTZ HALOGEN  
0 LAMPS @ 1500 WATTS/FIXT = 0 WATTS

METAL HALIDE  
0 FIXTURES @ 455 WATTS/FIXT = 0 WATTS

0 FIXTURES @ 1070 WATTS/FIXT = 0 WATTS

48 FIXTURES @ 1610 WATTS/FIXT = 77,280 WATTS

HIGH PRESSURE SODIUM  
0 FIXTURES @ 465 WATTS/FIXT = 0 WATTS

TOTAL EXISTING KWH

80,371

### REPLACEMENT CONTROL DATA

INCANDESCENT  
0 LAMPS @ 1000 WATTS/FIXT = 0 WATTS

QUARTZ HALOGEN  
0 LAMPS @ 1500 WATTS/FIXT = 0 WATTS

METAL HALIDE  
0 FIXTURES @ 455 WATTS/FIXT = 0 WATTS

0 FIXTURES @ 1070 WATTS/FIXT = 0 WATTS

48 FIXTURES @ 1610 WATTS/FIXT = 77,280 WATTS

HIGH PRESSURE SODIUM  
0 FIXTURES @ 465 WATTS/FIXT = 0 WATTS

TOTAL REPLACEMENT KWH

68,316

NET ENERGY SAVINGS

41.132 MBTU/YR

NET DOLLAR SAVINGS

\$302.10



# FORT KNOX LIMITED ENERGY STUDY

ECO 4.2: INSTALL LIGHTING CONTROLS ON BALLFIELD LIGHTING SYSTEM  
30 SEPTEMBER 1993

## FACILITY LIGHTING REPLACEMENT

BALLFIELD #: 6647

BALLFIELD LOCATION: EAST - WEST

ELECTRIC COSTS:

ENERGY CHARGE \$0.02506 PER KWH

CURRENT ESTIMATED HOURS OF OPERATION:  
HOURS/YEAR 1040

REVISED ESTIMATED HOURS OF OPERATION:  
HOURS/YEAR 884

### EXISTING CONTROL DATA

INCANDESCENT  
0 LAMPS @ 1000 WATTS/FIXT = 0 WATTS

QUARTZ HALOGEN  
0 LAMPS @ 1500 WATTS/FIXT = 0 WATTS

METAL HALIDE  
0 FIXTURES @ 455 WATTS/FIXT = 0 WATTS

0 FIXTURES @ 1070 WATTS/FIXT = 0 WATTS

50 FIXTURES @ 1610 WATTS/FIXT = 80,500 WATTS

HIGH PRESSURE SODIUM  
0 FIXTURES @ 465 WATTS/FIXT = 0 WATTS

TOTAL EXISTING KWH

83,720

### REPLACEMENT CONTROL DATA

INCANDESCENT  
0 LAMPS @ 1000 WATTS/FIXT = 0 WATTS

QUARTZ HALOGEN  
0 LAMPS @ 1500 WATTS/FIXT = 0 WATTS

METAL HALIDE  
0 FIXTURES @ 455 WATTS/FIXT = 0 WATTS

0 FIXTURES @ 1070 WATTS/FIXT = 0 WATTS

50 FIXTURES @ 1610 WATTS/FIXT = 80,500 WATTS

HIGH PRESSURE SODIUM  
0 FIXTURES @ 465 WATTS/FIXT = 0 WATTS

TOTAL REPLACEMENT KWH

71,162

NET ENERGY SAVINGS

42.848 MBTU/YR

NET DOLLAR SAVINGS

\$314.70



Tue 21 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES

TIME 10:22:26

TITLE PAGE

---

LIMITED ENERGY STUDY  
FT KNOX, KY  
ECO-4.2: BALL FIELD LIGHTING CONTROLS

Contract No: 27-93-C-0096

Prepared By: Systems Corp  
Estimator: Julie A. Hollensbe  
Estimate Prep. Date: 09/30/93

Current UPB/CSI ID: ORL290

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CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: OBPE42

3-549



Tue 21 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-4.2: BALL FIELD LIGHTING CONTROLS

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Tue 21 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
 LIMITED ENERGY STUDY / FT KNOX, KY  
 ECO-4.2: BALL FIELD LIGHTING CONTROLS  
 1. BUILDING TO THE 5 FOOT LINE / AA. ELECTRICAL

TIME 10:22:26

DETAILED ESTIMATE

DETAIL PAGE 1

BASE BID

DIVISION 16 ELECTRICAL	QUANTITY	UOM	CREW	MANHR	LABOR	EQUIPMENT	MATERIAL	SALESTY	DIRECT \$
16900 CONTROLS AND INSTRUMENTATION									
16930 1220 3-POLE									
CD=4 EL 1221 30 AMP	** OVERRIDES L,M **			2.50	82.53	0.32	150.00	7.50	240.35
WC=1100	1.00 EA EELEB			3	83	0	150	8	240
16930 2000 PHOTO-CELL, RELAY, LIGHTING ARRESTER, RECEPTACLE AND BRACKET									
CD=3 EL 2005 240 - 480 VOLTS	*** UNIT COSTS: ***			1.25	41.26	0.16	50.00	2.50	93.92
WC=1100	1.00 EA EELEB			1	41	0	50	3	94
16930 5000 TIME CLOCKS									
CD=3 EL 5001 TIME CLOCK FOR LIGHTING CONTROL	*** UNIT COSTS: ***			1.25	41.26	0.16	50.00	2.50	93.92
WC=1100	1.00 EA EELEB			1	41	0	50	3	94
TOTAL DIVISION 16 ELECTRICAL				5	165	1	250	13	428
TOTAL FACILITY AA. ELECTRICAL				5	165	1	250	13	428
TOTAL BID ITEM 1. BUILDING TO THE 5 FOOT LINE				5	165	1	250	13	428
TOTAL BASE BID				5	165	1	250	13	428
TOTAL ADDITIVE				0	0	0	0	0	0
TOTAL INCL ADD LIMITED ENERGY STUDY				5	165	1	250	13	428

\* \* \* END OF DETAIL REPORT \* \* \*

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: OBPE42

3-551



Tue 21 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-4.2: BALL FIELD LIGHTING CONTROLS

TIME 10:22:26

PROJECT NOTES

SUMMARY PAGE 1

---

PROJECT NOTES

ECO-4.2: BALL FIELD LIGHTING CONTROLS

SCOPE OF WORK: EVALUATE USE OF CONTROLS FOR BALLFIELD LIGHTING IN  
SELECTED AREAS AT FT KNOX.

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: OBPE42

3-552



Tue 21 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-4.2: BALL FIELD LIGHTING CONTROLS

TIME 10:22:26

BID ITEM AND FACILITY SUMMARY

SUMMARY PAGE 2

BID ITEM 1 BUILDING TO THE 5 FOOT LINE

BASE BID

ID	FACILITY	COST TO PRM	OVERHEAD	HOME OFC	PROFIT	BOND	OTHR FCTR	TOTAL COST	UNIT COST
AA	ELECTRICAL		10.0%	0.0%	7.5%	2.5%	0.0%		
	1.00 EA	428	43	0	35	13	0	519	518.99
<hr/>									
BID ITEM TOTAL	1.00 EA	428	43	0	35	13	0	519	518.99
<hr/>									
TOTAL BASE BID		428	43	0	35	13	0	519	
TOTAL ADDITIVE		0	0	0	0	0	0	0	
<hr/>									
TOTAL INCL ADD		428	43	0	35	13	0	519	

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: OBPE42

3-553



Tue 21 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
 LIMITED ENERGY STUDY / FT KNOX, KY  
 ECO-4.2: BALL FIELD LIGHTING CONTROLS

TIME 10:22:26

PROJECT CWE SUMMARY

SUMMARY PAGE 3

ID	BID ITEM	QUANTITY UOM	BASE BID	ADDITIVE	TOTAL COST	UNIT COST
	1. BUILDING TO THE 5 FOOT LINE	1.00 EA	519		519	519.00
	TOTAL CURRENT CONTRACT COST		519	0	519	
	Cost Growth from 09/93 to 09/94 Index Values: 0000 0000	0.0%	0	0	0	
	ESCALATED CONTRACT COST		519	0	519	
	Government-Furnished Property		0		0	
	SUBTOTAL		519	0	519	
	Contingencies	10.0%	52	0	52	
	SUBTOTAL		571	0	571	
	SIOH (S&A)	5.0%	29	0	29	
	CURRENT WORKING ESTIMATE		599	0	599	

Estimated Construction Time 365 Days

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: OBPE42

3-554



Tue 21 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-4.2: BALL FIELD LIGHTING CONTROLS

TIME 10:22:26

CONTRACTOR DIRECT SUMMARY

SUMMARY PAGE 4

ID	CONTRACTOR	PM	QUANTITY	UOM	MANHRS	LABOR	EQUIPMENT	MAT	W/TX	** TOTAL DIRECT *	* SUBCON *	W/OH&P	SUBTOTAL
										AMOUNT	PCT		
AA	GENERAL/PRIME		1.00	EA	5	165	1	263		428	100.0%	0	428
	TOTAL DIRECT				5	165	1	263		428	100.0%		

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: OBPE42

3-555



Tue 21 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-4.2: BALL FIELD LIGHTING CONTROLS

TIME 10:22:26

CONTRACTOR INDIRECT SUMMARY

SUMMARY PAGE 5

-----			*** OVERHEAD ***			-----			**** PROFIT ****			-----			***** TOTAL CONTRACT *****		
ID	CONTRACTOR	PM	SUBTOTAL	AMOUNT	PCT	HOFC%	AMOUNT	PCT	BOND%	OTHR%	AMOUNT	PCT	UNIT	COST			
AA	GENERAL/PRIME		428	43	10.0%	0.0	35	7.5%	2.5%	0.0%	519	100.0%	519.00				
				-----			-----										
				43	10.0%		35	7.5%									
			TOTAL OVERHEAD & PROFIT														

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: OBPE42

3-556



Tue 21 Sep 1993

U.S. ARMY CORPS of ENGINEERS H-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-4.2: BALL FIELD LIGHTING CONTROLS

TIME 10:22:26

CSI DIVISION SUMMARY

SUMMARY PAGE 6

ID CSI DIVISION	MANHOURS	LABOR	EQUIPMENT	MATERIAL	SALES TAX	***** TOTAL * DIRECT
16 ELECTRICAL	5	165	1	250	13	428
TOTAL DIRECT	5	165	1	250	13	428

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: OBPE42

3-557



Tue 21 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-4.2: BALL FIELD LIGHTING CONTROLS

TIME 10:22:26

SYSTEMS SUMMARY

SUMMARY PAGE 7

ID SYSTEM	MANHOURS	LABOR	EQUIPMENT	MATERIAL	SALES TAX	***** TOTAL * DIRECT
11 INTERIOR ELECTRICAL	5	165	1	250	13	428
TOTAL DIRECT	5	165	1	250	13	428

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: OBPE42

3-558



Tue 21 Sep 1993

U.S. ARMY CORPS of ENGINEERS H-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-4.2: BALL FIELD LIGHTING CONTROLS

TIME 10:22:26

EQUIPMENT SUMMARY

SUMMARY PAGE 8

----- *** BOOK VALUE *** ADJ FACTOR ADJUSTD BOOK OP -- HRLY --- UPB **** TOTAL ****												
EQUIP DESCRIPTION	LIFE HRS	TL	HRLY	OWNRSH	OWNS	OVTM	OWNRSH	EXPENSE	RATE	RATE	HOURS	COST
-----												
EMI20 SMALL TOOLS									1.40	1.40	1	1
											-----	-----
TOTAL PROJECT EQUIPMENT HOURS											1	1



Tue 21 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-4.2: BALL FIELD LIGHTING CONTROLS

TIME 10:22:26

LABOR SUMMARY

SUMMARY PAGE 9

CRAFT DESCRIPTION	BASE	OVERTM	TXS/INS	FRNG	TRVL	HRLY RATE	UPB RATE	**** HOURS	TOTAL COST
LELEC ELECTRICIANS	20.50	0.0%	24.0%	7.49	0.00	32.91	25.79	5	165
TOTAL PROJECT MANHOURS								5	165

\* \* \* END OF SUMMARY REPORT \* \* \*

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: OBPE42  
3-560



# FORT KNOX LIMITED ENERGY STUDY

## ECO 2: IMPROVE LIGHTING WITH ENERGY EFFICIENCY LIGHTING

05 NOVEMBER 1993

### FACILITY LIGHTING REPLACEMENT

BUILDING #: 2770  
BUILDING FUNCTION: MAINTENANCE

BUILDING USE:  
HOURS/DAY 10  
DAYS/WEEK 5

ELECTRIC COSTS:  
ENERGY CHARGE \$0.02506 PER KWH  
DEMAND CHARGE \$7.067 PER KW

#### EXISTING FIXTURE DATA

4 FOOT  
0 1 LAMP @ 48 WATTS/FIXT = 0 WATTS  
0 2 LAMP @ 96 WATTS/FIXT = 0 WATTS  
0 4 LAMP @ 192 WATTS/FIXT = 0 WATTS  
8 FOOT  
0 2 LAMP @ 158 WATTS/FIXT = 0 WATTS  
INCANDESCENT  
216 1 LAMP @ 1000 WATTS/FIXT = 216,000 WATTS  
1 LAMP @ WATTS/FIXT = 0 WATTS  
MERCURY VAPOR  
216 1 LAMP @ 454 WATTS/FIXT = 98,064 WATTS

TOTAL EXISTING KW 314.1  
TOTAL EXISTING KWH 816,566

NET ENERGY SAVINGS 1636.417 MBTU/YR

#### REPLACEMENT FIXTURE DATA

4 FOOT  
0 1 LAMP @ 37 WATTS/FIXT = 0 WATTS  
0 1 LAMP W/ REFLECTORS 37 WATTS/FIXT = 0 WATTS  
0 2 LAMP W/ REFLECTORS 58 WATTS/FIXT = 0 WATTS  
METAL HALIDE  
0 FIXTURES @ 185 WATTS/FIXT = 0 WATTS  
0 FIXTURES @ 215 WATTS/FIXT = 0 WATTS  
HIGH PRESSURE SODIUM  
0 FIXTURES @ 115 WATTS/FIXT = 0 WATTS  
432 FIXTURES @ 300 WATTS/FIXT = 129,600 WATTS  
0 FIXTURES @ 465 WATTS/FIXT = 0 WATTS

TOTAL REPLACEMENT KW 129.6  
TOTAL REPLACEMENT KWH 336,960

NET DOLLAR SAVINGS \$27,661 /YR



Mon 01 Nov 1993

U.S. ARMY CORPS of ENGINEERS M-CACES

TIME 11:00:54

TITLE PAGE

---

LIMITED ENERGY STUDY  
FT KNOX, KY  
ECO-2: BUILDING 2770

Contract No: 27-93-C-0096

Prepared By: Systems Corp  
Estimator: Julie A. Hollensbe  
Estimate Prep. Date: 11/05/93  
Current UPB/CSI ID: ORL290

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CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 2770E2

3-562



Mon 01 Nov 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 2770

TIME 11:00:54

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Mon 01 Nov 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 2770

TIME 11:00:54

DETAILED ESTIMATE

DETAIL PAGE 1

1. BUILDING TO THE 5 FOOT LINE / AA. ELECTRICAL

BASE BID

DIVISION 16 ELECTRICAL	QUANTITY	UOM	CREW	MANHR	LABOR	EQUIPMENT	MATERIAL	SALESTX	DIRECT \$
16500 LIGHTING									
16512 9000 HIGH INTENSITY DISCHARGE - HIGH PRESSURE SODIUM									
CD=3 EL 9006 250 W HPS FIXTURE AND LAMP	*** UNIT COSTS: ***			0.93	28.11	0.13	110.00	5.50	143.73
WC=1100	432.00 EA EELEF			403	12,141	54	47,520	2,376	62,092
TOTAL DIVISION 16 ELECTRICAL				403	12,141	54	47,520	2,376	62,092
TOTAL FACILITY AA. ELECTRICAL				403	12,141	54	47,520	2,376	62,092
TOTAL BID ITEM 1. BUILDING TO THE 5 FOOT LINE				403	12,141	54	47,520	2,376	62,092
TOTAL BASE BID				403	12,141	54	47,520	2,376	62,092
TOTAL ADDITIVE				0	0	0	0	0	0
TOTAL INCL ADD LIMITED ENERGY STUDY				403	12,141	54	47,520	2,376	62,092

\* \* \* END OF DETAIL REPORT \* \* \*

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 2770E2

3-564



Mon 01 Nov 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 2770

TIME 11:00:54

PROJECT NOTES

SUMMARY PAGE 1

---

PROJECT NOTES

ECO-2: ENERGY EFFICIENT LIGHTING

SCOPE OF WORK: EVALUATE USE OF HIGHER EFFICIENCY INTERIOR LIGHTING IN  
SELECTED FACILITIES AT FT KNOX.

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 2770E2

3-565



Mon 01 Nov 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 2770

TIME 11:00:54

BID ITEM AND FACILITY SUMMARY

SUMMARY PAGE 2

BID ITEM 1 BUILDING TO THE 5 FOOT LINE									BASE BID	
ID	FACILITY		COST TO PRM	OVERHEAD	HOME OFC	PROFIT	BOND	OTHR FCTR	TOTAL COST	UNIT COST
AA	ELECTRICAL	1.00 EA	62,092	10.0% 6,209	0.0% 0	7.5% 5,123	2.5% 1,836	0.0% 0	75,259	75259.26
BID ITEM TOTAL		1.00 EA	62,092	6,209	0	5,123	1,836	0	75,259	75259.26
TOTAL BASE BID			62,092	6,209	0	5,123	1,836	0	75,259	
TOTAL ADDITIVE			0	0	0	0	0	0	0	
TOTAL INCL ADD			62,092	6,209	0	5,123	1,836	0	75,259	

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 2770E2

3-566



Mon 01 Nov 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 2770

TIME 11:00:54

PROJECT CWE SUMMARY

SUMMARY PAGE 3

ID	BID ITEM	QUANTITY	UOM	BASE BID	ADDITIVE	TOTAL COST	UNIT COST
1.	BUILDING TO THE 5 FOOT LINE	1.00	EA	75,259		75,259	75259.30
	TOTAL CURRENT CONTRACT COST			75,259	0	75,259	
	Cost Growth from 09/93 to 09/94 Index Values: 0000 0000	0.0%		0	0	0	
	ESCALATED CONTRACT COST			75,259	0	75,259	
	Government-Furnished Property			0		0	
	SUBTOTAL			75,259	0	75,259	
	Contingencies	10.0%		7,526	0	7,526	
	SUBTOTAL			82,785	0	82,785	
	SIOH (S&A)	5.0%		4,139	0	4,139	
	CURRENT WORKING ESTIMATE			86,924	0	86,924	

Estimated Construction Time 365 Days

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 2770E2

3-567



Mon 01 Nov 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 2770

TIME 11:00:54

CONTRACTOR DIRECT SUMMARY

SUMMARY PAGE 4

ID	CONTRACTOR	PM	QUANTITY	UOM	MANHRS	LABOR	EQUIPMENT	MAT	W/TX	AMOUNT	PCT	W/OH&P	SUBTOTAL
AA	GENERAL/PRIME		1.00	EA	403	12,141	54	49,896	62,092	100.0%		0	62,092
	TOTAL DIRECT				403	12,141	54	49,896	62,092	100.0%			

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 2770E2

3-568



Mon 01 Nov 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 2770

TIME 11:00:54

CONTRACTOR INDIRECT SUMMARY

SUMMARY PAGE 5

ID	CONTRACTOR	PM	SUBTOTAL	*** OVERHEAD *** AMOUNT	PCT	HOFC%	**** PROFIT **** AMOUNT	PCT	BOND%	OTHR%	***** TOTAL CONTRACT ***** AMOUNT	PCT	UNIT COST
AA	GENERAL/PRIME		62,092	6,209	10.0%	0.0	5,123	7.5%	2.5%	0.0%	75,259	100.0%	75259.26
	TOTAL OVERHEAD & PROFIT			6,209	10.0%		5,123	7.5%					

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 2770E2

3-569



Mon 01 Nov 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 2770

TIME 11:00:54

CSI DIVISION SUMMARY

SUMMARY PAGE 6

ID CSI DIVISION	MANHOURS	LABOR	EQUIPMENT	MATERIAL	SALES TAX	***** TOTAL * DIRECT
16 ELECTRICAL	403	12,141	54	47,520	2,376	62,092
TOTAL DIRECT	403	12,141	54	47,520	2,376	62,092

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 2770E2

3-570



Mon 01 Nov 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 2770

TIME 11:00:54

SYSTEMS SUMMARY

SUMMARY PAGE 7

ID SYSTEM	MANHOURS	LABOR	EQUIPMENT	MATERIAL	SALES TAX	***** TOTAL * DIRECT
11 INTERIOR ELECTRICAL	403	12,141	54	47,520	2,376	62,092
TOTAL DIRECT	403	12,141	54	47,520	2,376	62,092

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 2770E2

3-571



Mon 01 Nov 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 2770

TIME 11:00:54

EQUIPMENT SUMMARY

SUMMARY PAGE 8

EQUIP DESCRIPTION	LIFE HRS	TL HRLY	*** BOOK VALUE ***	OWNRSH	OWNS	OVTM	ADJUSTD	BOOK OP	-- HRLY	--- UPB	**** TOTAL ****	COST
							OWNRSH	EXPENSE	RATE	RATE	HOURS	
EMI20 SMALL TOOLS									1.40	1.40	39	54
TOTAL PROJECT EQUIPMENT HOURS											39	54

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 2770E2

3-572



Mon 01 Nov 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 2770

TIME 11:00:54

LABOR SUMMARY

SUMMARY PAGE 9

CRAFT DESCRIPTION	BASE	OVERTM	TXS/INS	FRNG	TRVL	HRLY RATE	UPB RATE	**** HOURS	TOTAL COST
LELEC ELECTRICIANS	20.50	0.0%	24.0%	7.49	0.00	32.91	25.79	403	12,142
TOTAL PROJECT MANHOURS								403	12,142

\* \* \* END OF SUMMARY REPORT \* \* \*

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 2770E2

3-573



# FORT KNOX LIMITED ENERGY STUDY

## ECO 2: IMPROVE LIGHTING WITH ENERGY EFFICIENCY LIGHTING

05 NOVEMBER 1993

### FACILITY LIGHTING REPLACEMENT

BUILDING #: 2778  
BUILDING FUNCTION: MAINTENANCE

BUILDING USE:  
HOURS/DAY 10  
DAYS/WEEK 5

ELECTRIC COSTS:  
ENERGY CHARGE \$0.02506 PER KWH  
DEMAND CHARGE \$7.067 PER KW

#### EXISTING FIXTURE DATA

4 FOOT  
0 1 LAMP @ 48 WATTS/FIXT = 0 WATTS  
0 2 LAMP @ 96 WATTS/FIXT = 0 WATTS  
0 4 LAMP @ 192 WATTS/FIXT = 0 WATTS  
8 FOOT  
0 2 LAMP @ 158 WATTS/FIXT = 0 WATTS  
INCANDESCENT  
0 1 LAMP @ WATTS/FIXT = 0 WATTS  
0 1 LAMP @ WATTS/FIXT = 0 WATTS  
MERCURY VAPOR  
150 1 LAMP @ 454 WATTS/FIXT = 68,100 WATTS

TOTAL EXISTING KW 68.1  
TOTAL EXISTING KWH 177,060

NET ENERGY SAVINGS

204.925 MBTU/YR

\$3,464 /YR

#### REPLACEMENT FIXTURE DATA

4 FOOT  
0 1 LAMP @ 37 WATTS/FIXT = 0 WATTS  
0 1 LAMP W/ REFLECTORS 37 WATTS/FIXT = 0 WATTS  
0 2 LAMP W/ REFLECTORS 58 WATTS/FIXT = 0 WATTS  
METAL HALIDE  
0 FIXTURES @ 185 WATTS/FIXT = 0 WATTS  
0 FIXTURES @ 215 WATTS/FIXT = 0 WATTS  
HIGH PRESSURE SODIUM  
0 FIXTURES @ 115 WATTS/FIXT = 0 WATTS  
150 FIXTURES @ 300 WATTS/FIXT = 45,000 WATTS  
0 FIXTURES @ 465 WATTS/FIXT = 0 WATTS

TOTAL REPLACEMENT KW 45.0  
TOTAL REPLACEMENT KWH 117,000

NET DOLLAR SAVINGS

\$3,464 /YR



Mon 01 Nov 1993

U.S. ARMY CORPS of ENGINEERS M-CACES

TIME 11:12:35

TITLE PAGE

---

LIMITED ENERGY STUDY  
FT KNOX, KY  
ECO-2: BUILDING 2778

Contract No: 27-93-C-0096

Prepared By: Systems Corp  
Estimator: Julie A. Hollensbe  
Estimate Prep. Date: 11/05/93  
Current UPB/CSI ID: ORL290

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CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 2770E2

3-575



Mon 01 Nov 1993

U.S. ARMY CORPS of ENGINEERS W-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 2778

TIME 11:12:35

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DETAILED ESTIMATE	DETAIL PAGE
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AA. ELECTRICAL.....	1

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Mon 01 Nov 1993  
DETAILED ESTIMATE

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 2778

TIME 11:12:35  
DETAIL PAGE 1

1. BUILDING TO THE 5 FOOT LINE / AA. ELECTRICAL

BASE BID

DIVISION 16 ELECTRICAL	QUANTITY	UOM	CREW	MANHR	LABOR	EQUIPMENT	MATERIAL	SALESTX	DIRECT \$
16500 LIGHTING									
16512 9000 HIGH INTENSITY DISCHARGE - HIGH PRESSURE SODIUM									
CD=3 EL 9006 250 W HPS FIXTURE AND LAMP	*** UNIT COSTS: ***			0.93	28.11	0.13	110.00	5.50	143.73
WC=1100	150.00 EA EELEF			140	4,216	19	16,500	825	21,560
TOTAL DIVISION 16 ELECTRICAL				140	4,216	19	16,500	825	21,560
TOTAL FACILITY AA. ELECTRICAL				140	4,216	19	16,500	825	21,560
TOTAL BID ITEM 1. BUILDING TO THE 5 FOOT LINE				140	4,216	19	16,500	825	21,560
TOTAL BASE BID				140	4,216	19	16,500	825	21,560
TOTAL ADDITIVE				0	0	0	0	0	0
TOTAL INCL ADD LIMITED ENERGY STUDY				140	4,216	19	16,500	825	21,560

\* \* \* END OF DETAIL REPORT \* \* \*

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 2770E2

3-577



Mon 01 Nov 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 2778

TIME 11:12:35

PROJECT NOTES

SUMMARY PAGE 1

---

PROJECT NOTES

ECO-2: ENERGY EFFICIENT LIGHTING

SCOPE OF WORK: EVALUATE USE OF HIGHER EFFICIENCY INTERIOR LIGHTING IN  
SELECTED FACILITIES AT FT KNOX.

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 2770E2

3-578



Mon 01 Nov 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 2778

TIME 11:12:35

BID ITEM AND FACILITY SUMMARY

SUMMARY PAGE 2

BID ITEM 1 BUILDING TO THE 5 FOOT LINE

BASE BID

ID	FACILITY	COST TO PRM	OVERHEAD	HOME OFC	PROFIT	BOND	OTHR FCTR	TOTAL COST	UNIT COST
AA	ELECTRICAL	1.00 EA	21,560	10.0% 2,156	0.0% 0	7.5% 1,779	2.5% 637	0.0% 0	26,132 26131.69
BID ITEM TOTAL		1.00 EA	21,560	2,156	0	1,779	637	0	26,132 26131.69
TOTAL BASE BID			21,560	2,156	0	1,779	637	0	26,132
TOTAL ADDITIVE			0	0	0	0	0	0	0
TOTAL INCL ADD			21,560	2,156	0	1,779	637	0	26,132

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 2770E2

3-579



Mon 01 Nov 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 2778

TIME 11:12:35

PROJECT CWE SUMMARY

SUMMARY PAGE 3

ID	BID ITEM	QUANTITY	UOM	BASE BID	ADDITIVE	TOTAL COST	UNIT COST
1.	BUILDING TO THE 5 FOOT LINE	1.00	EA	26,132		26,132	26131.70
	TOTAL CURRENT CONTRACT COST			26,132	0	26,132	
	Cost Growth from 09/93 to 09/94 Index Values: 0000 0000	0.0%		0	0	0	
	ESCALATED CONTRACT COST			26,132	0	26,132	
	Government-Furnished Property			0		0	
	SUBTOTAL			26,132	0	26,132	
	Contingencies	10.0%		2,613	0	2,613	
	SUBTOTAL			28,745	0	28,745	
	SIOH (S&A)	5.0%		1,437	0	1,437	
	CURRENT WORKING ESTIMATE			30,182	0	30,182	

Estimated Construction Time 365 Days

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 2770E2

3-580



Mon 01 Nov 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 2778

TIME 11:12:35

CONTRACTOR DIRECT SUMMARY

SUMMARY PAGE 4

ID	CONTRACTOR	PM	QUANTITY	UOM	MANHRS	LABOR	EQUIPMENT	MAT	W/TX	AMOUNT	PCT	W/OH&P	SUBTOTAL
AA	GENERAL/PRIME		1.00	EA	140	4,216	19	17,325		21,560	100.0%	0	21,560
	TOTAL DIRECT				140	4,216	19	17,325		21,560	100.0%		

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 2770E2

3-581



Mon 01 Nov 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 2778

TIME 11:12:35

CONTRACTOR INDIRECT SUMMARY

SUMMARY PAGE 5

ID	CONTRACTOR	PM	SUBTOTAL	*** OVERHEAD ***	AMOUNT	PCT	HOFC%	**** PROFIT ****	AMOUNT	PCT	BOND%	OTHER%	***** TOTAL CONTRACT *****	AMOUNT	PCT	UNIT COST
AA	GENERAL/PRIME		21,560	2,156	10.0%	0.0		1,779	7.5%	2.5%	0.0%		26,132	100.0%		26131.69
	TOTAL OVERHEAD & PROFIT			2,156	10.0%			1,779	7.5%							

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 2770E2

3-582



Mon 01 Nov 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 2778

TIME 11:12:35

CSI DIVISION SUMMARY

SUMMARY PAGE 6

ID CSI DIVISION	MANHOURS	LABOR	EQUIPMENT	MATERIAL	SALES TAX	***** TOTAL * DIRECT
16 ELECTRICAL	140	4,216	19	16,500	825	21,560
TOTAL DIRECT	140	4,216	19	16,500	825	21,560

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 2770E2

3-583



Mon 01 Nov 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 2778

TIME 11:12:35

SYSTEMS SUMMARY

SUMMARY PAGE 7

ID SYSTEM	MANHOURS	LABOR	EQUIPMENT	MATERIAL	SALES TAX	***** TOTAL * DIRECT
11 INTERIOR ELECTRICAL	140	4,216	19	16,500	825	21,560
TOTAL DIRECT	140	4,216	19	16,500	825	21,560

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 2770E2

3-584



Mon 01 Nov 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 2778

TIME 11:12:35

EQUIPMENT SUMMARY

SUMMARY PAGE 8

EQUIP DESCRIPTION	LIFE HRS	TL HRLY	OWNRSH	OWNS	OVTM	OWNRSH	EXPENSE	HRLY RATE	UPB RATE	HOURS	TOTAL COST
EMI20 SMALL TOOLS								1.40	1.40	14	19
TOTAL PROJECT EQUIPMENT HOURS										14	19

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 2770E2

3-585



Mon 01 Nov 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 2778

TIME 11:12:35

LABOR SUMMARY

SUMMARY PAGE 9

CRAFT DESCRIPTION	BASE	OVERTM	TXS/INS	FRNG	TRVL	HRLY RATE	UPB RATE	**** HOURS	TOTAL COST
LELEC ELECTRICIANS	20.50	0.0%	24.0%	7.49	0.00	32.91	25.79	140	4,216
TOTAL PROJECT MANHOURS								140	4,216

\* \* \* END OF SUMMARY REPORT \* \* \*

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 2770E2

3-586



# FORT KNOX LIMITED ENERGY STUDY

ECO 3.1: INSTALL PHOTOCELL LIGHTING CONTROLS TO REDUCE LIGHT LEVELS WHEN POSSIBLE  
05 NOVEMBER 1993

## FACILITY LIGHTING CONTROL INSTALLATION - ON/OFF PHOTOCELLS

BUILDING #: 2770  
BUILDING FUNCTION: MAINTENANCE

BUILDING USE:  
HOURS/DAY 10  
DAYS/WEEK 5

### EXISTING FIXTURE DATA:

LAMP TYPE HIGH PRESSURE SODIUM  
FIXTURE WATTAGE 300 WATTS  
NUMBER OF FIXTURES 432

### ELECTRIC COSTS:

ENERGY CHARGE \$0.02506 PER KWH  
DEMAND CHARGE \$7.067 PER KW

### EXISTING LIGHTING CONTROL DATA

0 FIXTS. @ 0.300 KW @ 0% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.300 KW @ 10% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.300 KW @ 20% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.300 KW @ 40% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.300 KW @ 60% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.300 KW @ 80% OUTPUT \* 0 HR/YR = 0 KWH/YR  
432 FIXTS. @ 0.300 KW @ 100% OUTPUT \* 2,800 HR/YR = 336,960 KWH/YR

TOTAL EXISTING KWH

336,960

### REVISED LIGHTING CONTROL DATA

216 FIXTS. @ 0.300 KW @ 0% OUTPUT \* 2,350 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.300 KW @ 10% OUTPUT \* HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.300 KW @ 20% OUTPUT \* HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.300 KW @ 40% OUTPUT \* HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.300 KW @ 60% OUTPUT \* HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.300 KW @ 80% OUTPUT \* HR/YR = 0 KWH/YR  
216 FIXTS. @ 0.300 KW @ 100% OUTPUT \* 250 HR/YR = 16,200 KWH/YR  
216 FIXTS. @ 0.300 KW @ 100% OUTPUT \* 2,800 HR/YR = 188,480 KWH/YR

TOTAL REVISED CONTROL KWH

184,680

NET ENERGY SAVINGS

519.58 MBTU/YR

NET DOLLAR SAVINGS

\$9,311 /YR



Mon 01 Nov 1993

U.S. ARMY CORPS of ENGINEERS M-CACES

TIME 11:23:25

TITLE PAGE

---

LIMITED ENERGY STUDY  
FT KNOX, KY  
ECO-3.1: BUILDING 2770

Contract No: 27-93-C-0096

Prepared By: Systems Corp  
Estimator: Julie A. Hollensbe  
Estimate Prep. Date: 11/05/93  
Current UPB/CSI ID: ORL290

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CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 086E31

3-588



Mon 01 Nov 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2770

TIME 11:23:25

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Mon 01 Nov 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2770

TIME 11:23:25

DETAILED ESTIMATE

DETAIL PAGE 1

1. BUILDING TO THE 5 FOOT LINE / AA. ELECTRICAL

BASE BID

DIVISION 16 ELECTRICAL			QUANTITY	UOM	CREW	MANHR	LABOR	EQUIPMENT	MATERIAL	SALESTX	DIRECT \$
<hr/>											
16050 BASIC MATERIALS AND METHODS											
16120 1100 SINGLE SOLID CONDUCTOR.											
CD=4 EL 1102 NO. 12 AWG - TYPE THW INSULATION ***			UNIT COSTS: ***			7.14	215.37	0.97	72.72	3.64	292.69
WC=1100			1.80 MLF EELEF			13	388	2	131	7	527
<hr/>											
16900 CONTROLS AND INSTRUMENTATION											
16930 2000 PHOTO-CELL, RELAY, LIGHTING ARRESTER, RECEPTACLE AND BRACKET											
CD=3 EL 2003 PHOTOCELL FOR ON/OFF CONTROL			*** UNIT COSTS: ***			0.63	20.63	0.08	600.00	30.00	650.71
WC=1100 BASED ON FOOTCANDLE READING			5.00 EA EELEB			3	103	0	3,000	150	3,254
CD=3 EL 2004 CIRCUIT FOR CONTROL PANEL FOR			*** UNIT COSTS: ***			1.25	41.26	0.16	100.00	5.00	146.42
WC=1100 ON/OFF PHOTOCELL CONTROL			18.00 EA EELEB			23	743	3	1,800	90	2,636
						<hr/>					
TOTAL DIVISION 16 ELECTRICAL						38	1,234	5	4,931	247	6,416
						<hr/>					
TOTAL FACILITY AA. ELECTRICAL						38	1,234	5	4,931	247	6,416
						<hr/>					
TOTAL BID ITEM 1. BUILDING TO THE 5 FOOT LINE						38	1,234	5	4,931	247	6,416
						<hr/>					
TOTAL BASE BID						38	1,234	5	4,931	247	6,416
						<hr/>					
TOTAL ADDITIVE						0	0	0	0	0	0
						<hr/>					
TOTAL INCL ADD LIMITED ENERGY STUDY						38	1,234	5	4,931	247	6,416

\* \* \* END OF DETAIL REPORT \* \* \*

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 086E31

3-590



Mon 01 Nov 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2770

TIME 11:23:25

PROJECT NOTES

SUMMARY PAGE 1

---

PROJECT NOTES

ECO-3: FACILITY LIGHTING CONTROLS

SCOPE OF WORK: EVALUATE USE OF LIGHTING CONTROLS TO SAVE ENERGY IN  
SELECTED FACILITIES AT FT KNOX.

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 086E31

3-591



Mon 01 Nov 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2770

TIME 11:23:25

BID ITEM AND FACILITY SUMMARY

SUMMARY PAGE 2

BID ITEM 1 BUILDING TO THE 5 FOOT LINE

BASE BID

ID	FACILITY	COST TO PRM	OVERHEAD	HOME OFC	PROFIT	BOND	OTHER FCTR	TOTAL COST	UNIT COST
AA	ELECTRICAL	1.00 EA	6,416	10.0% 642	0.0% 0	7.5% 529	2.5% 190	0.0% 0	7,777 7776.63
BID ITEM TOTAL	1.00 EA	6,416	642	0	529	190	0	7,777	7776.63
TOTAL BASE BID		6,416	642	0	529	190	0	7,777	
TOTAL ADDITIVE		0	0	0	0	0	0	0	
TOTAL INCL ADD		6,416	642	0	529	190	0	7,777	

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 086E31

3-592



Mon 01 Nov 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2770

TIME 11:23:25

PROJECT CWE SUMMARY

SUMMARY PAGE 3

ID	BID ITEM	QUANTITY UOM	BASE BID	ADDITIVE	TOTAL COST	UNIT COST
	1. BUILDING TO THE 5 FOOT LINE	1.00 EA	7,777		7,777	7776.60
	TOTAL CURRENT CONTRACT COST		7,777	0	7,777	
	Cost Growth from 09/93 to 09/94 Index Values: 0000 0000	0.0%	0	0	0	
	ESCALATED CONTRACT COST		7,777	0	7,777	
	Government-Furnished Property		0		0	
	SUBTOTAL		7,777	0	7,777	
	Contingencies	10.0%	778	0	778	
	SUBTOTAL		8,554	0	8,554	
	SIOH (S&A)	5.0%	428	0	428	
	CURRENT WORKING ESTIMATE		8,982	0	8,982	

Estimated Construction Time 365 Days

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 086E31

3-593



Mon 01 Nov 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2770

TIME 11:23:25

CONTRACTOR DIRECT SUMMARY

SUMMARY PAGE 4

ID	CONTRACTOR	PM	QUANTITY	UOM	MANHRS	LABOR	EQUIPMENT	MAT W/TX	AMOUNT	PCT	W/OH&P	SUBTOTAL
AA	GENERAL/PRIME		1.00	EA	38	1,234	5	5,177	6,416	100.0%	0	6,416
	TOTAL DIRECT				38	1,234	5	5,177	6,416	100.0%		

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 086E31

3-594



Mon 01 Nov 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2770

TIME 11:23:25

CONTRACTOR INDIRECT SUMMARY

SUMMARY PAGE 5

ID	CONTRACTOR	PM	SUBTOTAL	*** OVERHEAD *** AMOUNT	PCT	HOFC%	**** PROFIT **** AMOUNT	PCT	BOND%	OTHR%	***** TOTAL CONTRACT ***** AMOUNT	PCT	UNIT COST
AA	GENERAL/PRIME		6,416	642	10.0%	0.0	529	7.5%	2.5%	0.0%	7,777	100.0%	7776.62
	TOTAL OVERHEAD & PROFIT			642	10.0%		529	7.5%					

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 086E31

3-595



Mon 01 Nov 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2770

TIME 11:23:25

CSI DIVISION SUMMARY

SUMMARY PAGE 6

ID CSI DIVISION	MANHOURS	LABOR	EQUIPMENT	MATERIAL	SALES TAX	***** TOTAL * DIRECT
16 ELECTRICAL	38	1,234	5	4,931	247	6,416
TOTAL DIRECT	38	1,234	5	4,931	247	6,416

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 086E31

3-596



Mon 01 Nov 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2770

TIME 11:23:25

SYSTEMS SUMMARY

SUMMARY PAGE 7

ID SYSTEM	MANHOURS	LABOR	EQUIPMENT	MATERIAL	SALES TAX	***** TOTAL * DIRECT
11 INTERIOR ELECTRICAL	38	1,234	5	4,931	247	6,416
TOTAL DIRECT	38	1,234	5	4,931	247	6,416

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 086E31

3-597



Mon 01 Nov 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2770

TIME 11:23:25

EQUIPMENT SUMMARY

SUMMARY PAGE 8

EQUIP DESCRIPTION	LIFE HRS	TL HRLY	OWNRSH	OWNS	OVTM	OWNRSH	EXPENSE	HRLY RATE	UPB RATE	HOURS	TOTAL COST
EMI20 SMALL TOOLS								1.40	1.40	4	5
TOTAL PROJECT EQUIPMENT HOURS										4	5

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 086E31

3-598



Mon 01 Nov 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2770

TIME 11:23:25

LABOR SUMMARY

SUMMARY PAGE 9

CRAFT DESCRIPTION	BASE	OVERTM	TXS/INS	FRNG	TRVL	HRLY RATE	UPB RATE	**** HOURS	TOTAL COST
LELEC ELECTRICIANS	20.50	0.0%	24.0%	7.49	0.00	32.91	25.79	38	1,234
TOTAL PROJECT MANHOURS								38	1,234

\* \* \* END OF SUMMARY REPORT \* \* \*

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 086E31

3-599



# FORT KNOX LIMITED ENERGY STUDY

ECO 3.1: INSTALL PHOTOCELL LIGHTING CONTROLS TO REDUCE LIGHT LEVELS WHEN POSSIBLE  
05 NOVEMBER 1993

## FACILITY LIGHTING CONTROL INSTALLATION - ON/OFF PHOTOCELLS

BUILDING #: 2778  
BUILDING FUNCTION: MAINTENANCE  
EXISTING FIXTURE DATA:  
LAMP TYPE HIGH PRESSURE SODIUM  
FIXTURE WATTAGE 300 WATTS  
NUMBER OF FIXTURES 150

BUILDING USE:  
HOURS/DAY 10  
DAYS/WEEK 5

ELECTRIC COSTS:  
ENERGY CHARGE \$0.02506 PER KWH  
DEMAND CHARGE \$7.067 PER KW

### EXISTING LIGHTING CONTROL DATA

0 FIXTS. @ 0.300 KW @ 0% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.300 KW @ 10% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.300 KW @ 20% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.300 KW @ 40% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.300 KW @ 60% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.300 KW @ 80% OUTPUT \* 0 HR/YR = 0 KWH/YR  
150 FIXTS. @ 0.300 KW @ 100% OUTPUT \* 2,800 HR/YR = 117,000 KWH/YR

TOTAL EXISTING KWH 117,000

### REVISED LIGHTING CONTROL DATA

75 FIXTS. @ 0.300 KW @ 0% OUTPUT \* 2,350 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.300 KW @ 10% OUTPUT \* HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.300 KW @ 20% OUTPUT \* HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.300 KW @ 40% OUTPUT \* HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.300 KW @ 60% OUTPUT \* HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.300 KW @ 80% OUTPUT \* HR/YR = 0 KWH/YR  
75 FIXTS. @ 0.300 KW @ 100% OUTPUT \* 250 HR/YR = 5,625 KWH/YR  
75 FIXTS. @ 0.300 KW @ 100% OUTPUT \* 2,800 HR/YR = 58,500 KWH/YR

TOTAL REVISED CONTROL KWH 64,125

NET ENERGY SAVINGS 180.41 MBTU/YR

NET DOLLAR SAVINGS \$3,233 /YR



Mon 01 Nov 1993

U.S. ARMY CORPS of ENGINEERS M-CACES

TIME 11:29:16

TITLE PAGE

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LIMITED ENERGY STUDY  
FT KNOX, KY  
ECO-3.1: BUILDING 2778

Contract No: 27-93-C-0096

Prepared By: Systems Corp  
Estimator: Julie A. Hollensbe  
Estimate Prep. Date: 11/05/93  
Current UPB/CSI ID: ORL290

M - C A C E S E D I T I O N  
COMPOSER Plus Copyright (C) 1985, 1988  
by Building Systems Design, Inc.  
Release 4.20

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 086E31

3-601



Mon 01 Nov 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2778

TIME 11:29:16

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DETAILED ESTIMATE	DETAIL PAGE
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AA. ELECTRICAL.....	1

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Mon 01 Nov 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
 LIMITED ENERGY STUDY / FT KNOX, KY  
 ECO-3.1: BUILDING 2778  
 1. BUILDING TO THE 5 FOOT LINE / AA. ELECTRICAL

TIME 11:29:16

DETAILED ESTIMATE

DETAIL PAGE 1

BASE BID

DIVISION 16 ELECTRICAL	QUANTITY	UOM	CREW	MANHR	LABOR	EQUIPMENT	MATERIAL	SALESTX	DIRECT \$
16050 BASIC MATERIALS AND METHODS									
16120 1100 SINGLE SOLID CONDUCTOR.									
CD=4 EL 1102 NO. 12 AWG - TYPE THW INSULATION *** UNIT COSTS: ***	7.14			215.37	0.97	72.72	3.64	292.69	
WC=1100 1.80 MLF EELEF	13			388	2	131	7	527	
16900 CONTROLS AND INSTRUMENTATION									
16930 2000 PHOTO-CELL, RELAY, LIGHTING ARRESTER, RECEPTACLE AND BRACKET									
CD=3 EL 2003 PHOTOCCELL FOR ON/OFF CONTROL *** UNIT COSTS: ***	0.63			20.63	0.08	600.00	30.00	650.71	
WC=1100 BASED ON FOOTCANDLE READING 5.00 EA EELEB	3			103	0	3,000	150	3,254	
CD=3 EL 2004 CIRCUIT FOR CONTROL PANEL FOR *** UNIT COSTS: ***	1.25			41.26	0.16	100.00	5.00	146.42	
WC=1100 ON/OFF PHOTOCCELL CONTROL 18.00 EA EELEB	23			743	3	1,800	90	2,636	
TOTAL DIVISION 16 ELECTRICAL	38			1,234	5	4,931	247	6,416	
TOTAL FACILITY AA. ELECTRICAL	38			1,234	5	4,931	247	6,416	
TOTAL BID ITEM 1. BUILDING TO THE 5 FOOT LINE	38			1,234	5	4,931	247	6,416	
TOTAL BASE BID	38			1,234	5	4,931	247	6,416	
TOTAL ADDITIVE	0			0	0	0	0	0	0
TOTAL INCL ADD LIMITED ENERGY STUDY	38			1,234	5	4,931	247	6,416	

\*\*\* END OF DETAIL REPORT \*\*\*

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 086E31

3-603



Mon 01 Nov 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2778

TIME 11:29:16

SUMMARY PAGE 1

PROJECT NOTES

---

PROJECT NOTES

ECO-3: FACILITY LIGHTING CONTROLS

SCOPE OF WORK: EVALUATE USE OF LIGHTING CONTROLS TO SAVE ENERGY IN  
SELECTED FACILITIES AT FT KNOX.

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 086E31

3-604



Mon 01 Nov 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
 LIMITED ENERGY STUDY / FT KNOX, KY  
 ECO-3.1: BUILDING 2778

TIME 11:29:16

BID ITEM AND FACILITY SUMMARY

SUMMARY PAGE 2

BID ITEM 1 BUILDING TO THE 5 FOOT LINE

BASE BID

ID	FACILITY	COST TO PRM	OVERHEAD	HOME OFC	PROFIT	BOND	OTHR FCTR	TOTAL COST	UNIT COST	
AA	ELECTRICAL	1.00 EA	6,416	10.0% 642	0.0% 0	7.5% 529	2.5% 190	0.0% 0	7,777	7776.63
BID ITEM TOTAL		1.00 EA	6,416	642	0	529	190	0	7,777	7776.63
TOTAL BASE BID			6,416	642	0	529	190	0	7,777	
TOTAL ADDITIVE			0	0	0	0	0	0	0	
TOTAL INCL ADD			6,416	642	0	529	190	0	7,777	

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 086E31

3-605



Mon 01 Nov 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2778

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PROJECT CWE SUMMARY

SUMMARY PAGE 3

ID	BID ITEM	QUANTITY	UOM	BASE BID	ADDITIVE	TOTAL COST	UNIT COST
1.	BUILDING TO THE 5 FOOT LINE	1.00	EA	7,777		7,777	7776.60
TOTAL CURRENT CONTRACT COST				7,777	0	7,777	
Cost Growth from 09/93 to 09/94 Index Values: 0000 0000		0.0%		0	0	0	
ESCALATED CONTRACT COST				7,777	0	7,777	
Government-Furnished Property				0		0	
SUBTOTAL				7,777	0	7,777	
Contingencies		10.0%		778	0	778	
SUBTOTAL				8,554	0	8,554	
SIOH (S&A)		5.0%		428	0	428	
CURRENT WORKING ESTIMATE				8,982	0	8,982	

Estimated Construction Time 365 Days

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 086E31

3-606



Mon 01 Nov 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2778

TIME 11:29:16

CONTRACTOR DIRECT SUMMARY

SUMMARY PAGE 4

ID	CONTRACTOR	PM	QUANTITY	UOM	MANHRS	LABOR	EQUIPMENT	MAT W/TX	AMOUNT	PCT	W/OH&P	SUBTOTAL
AA	GENERAL/PRIME		1.00	EA	38	1,234	5	5,177	6,416	100.0%	0	6,416
	TOTAL DIRECT				38	1,234	5	5,177	6,416	100.0%		

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 086E31

3-607



Mon 01 Nov 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2778

TIME 11:29:16

CONTRACTOR INDIRECT SUMMARY

SUMMARY PAGE 5

ID	CONTRACTOR	PM	SUBTOTAL	*** OVERHEAD ***	AMOUNT	PCT	HOFC%	**** PROFIT ****	AMOUNT	PCT	BOND%	OTHR%	***** TOTAL CONTRACT *****	AMOUNT	PCT	UNIT COST
AA	GENERAL/PRIME		6,416	642	10.0%	0.0		529	7.5%	2.5%	0.0%		7,777	100.0%		7776.62
	TOTAL OVERHEAD & PROFIT			642	10.0%			529	7.5%							

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 086E31

3-608



Mon 01 Nov 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2778

TIME 11:29:16

CSI DIVISION SUMMARY

SUMMARY PAGE 6

ID CSI DIVISION	MANHOURS	LABOR	EQUIPMENT	MATERIAL	SALES TAX	***** TOTAL * DIRECT
16 ELECTRICAL	38	1,234	5	4,931	247	6,416
TOTAL DIRECT	38	1,234	5	4,931	247	6,416

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 086E31

3-609



Mon 01 Nov 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2778

TIME 11:29:16

SYSTEMS SUMMARY

SUMMARY PAGE 7

ID SYSTEM	MANHOURS	LABOR	EQUIPMENT	MATERIAL	SALES TAX	***** TOTAL * DIRECT
11 INTERIOR ELECTRICAL	38	1,234	5	4,931	247	6,416
TOTAL DIRECT	38	1,234	5	4,931	247	6,416

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 086E31

3-610



Mon 01 Nov 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2778

TIME 11:29:16

EQUIPMENT SUMMARY

SUMMARY PAGE 8

----- *** BOOK VALUE ***		ADJ FACTOR		ADJUSTD		BOOK OP --		HRLY ---		UPB		**** TOTAL ****	
EQUIP	DESCRIPTION	LIFE HRS	TL HRLY	OWNRSH	OWNS	OVTM	OWNRSH	EXPENSE	RATE	RATE	HOURS	COST	
EMI20	SMALL TOOLS								1.40	1.40	4	5	
												4	5
TOTAL PROJECT EQUIPMENT HOURS													

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 086E31

3-611



Mon 01 Nov 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2778

TIME 11:29:16

LABOR SUMMARY

SUMMARY PAGE 9

CRAFT DESCRIPTION	BASE	OVERTM	TXS/INS	FRNG	TRVL	HRLY RATE	UPB RATE	**** HOURS	TOTAL COST
LELEC ELECTRICIANS	20.50	0.0%	24.0%	7.49	0.00	32.91	25.79	38	1,234
TOTAL PROJECT MANHOURS								38	1,234

\* \* \* END OF SUMMARY REPORT \* \* \*

CREW ID: ORL290

CURRENCY in DOLLARS

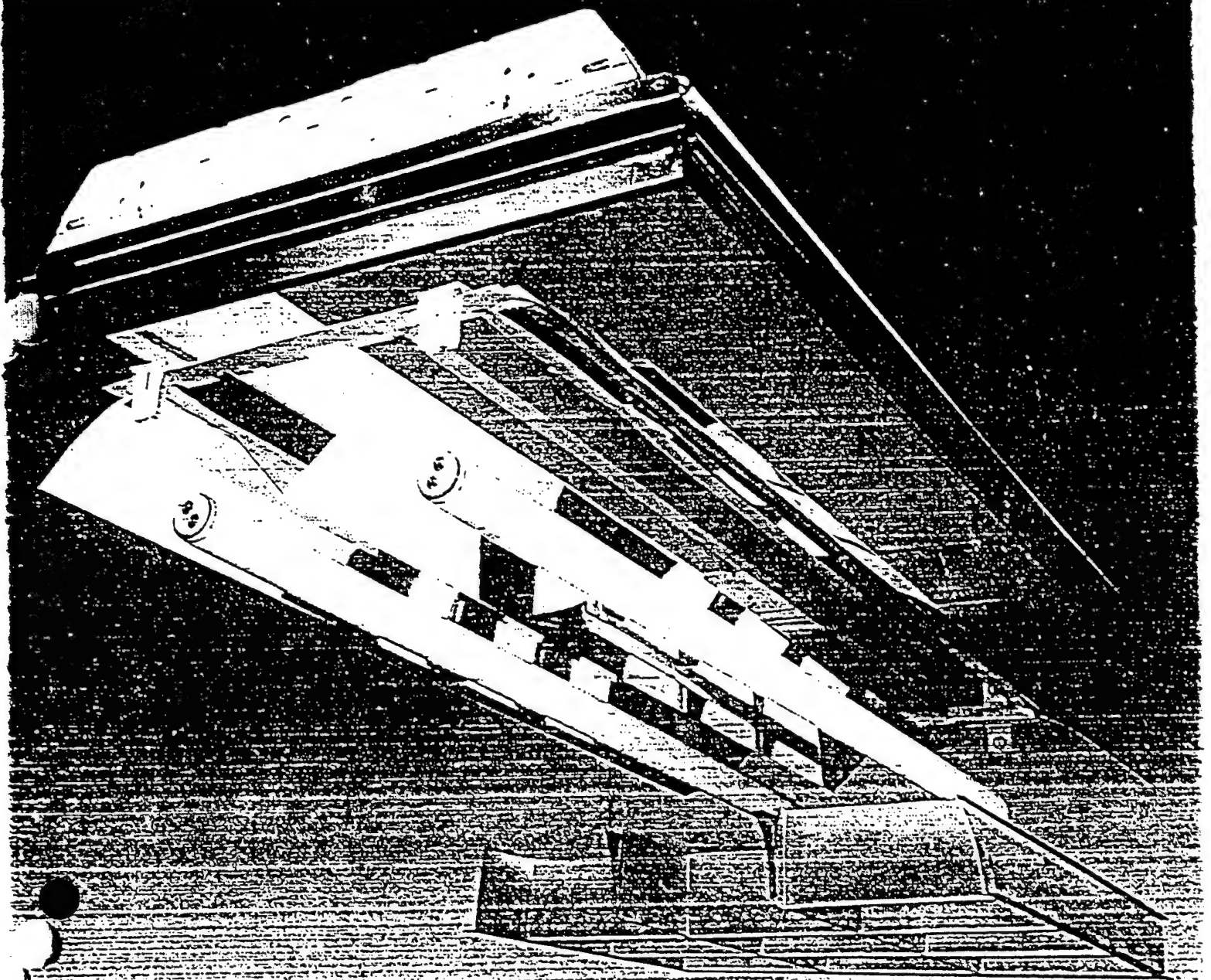
PROJECT ID: 086E31

3-612





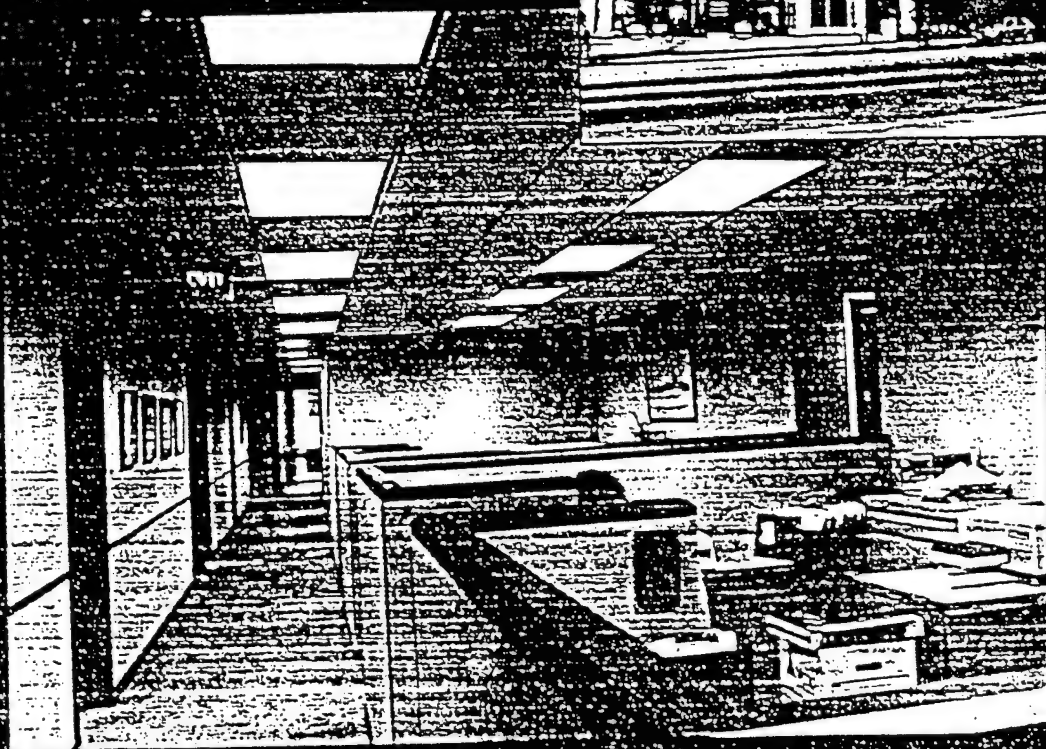
# Parke Powerlite 4 Series





# **With Parke Powerlites, You Can Save Up To 60% Of Your Lighting Costs Each Year!**

- Dramatic reduction in energy consumption.
- Operates on .8 - 1.5 watts per square foot.
- Lowers heat load factors enabling HVAC systems to be down-sized.
- Lowers operating costs up to \$1.00 per square foot.
- Increases visual comfort level.



**Parke Powerlites incorporate the latest state of the art reflector technology with the best lamp, ballast, lens and louver combinations to produce maximum efficiency and an excellent return on investment.**



# Model #PP4242ESP 2B1

#7568 - PARKE POWERLITE 4 SERIES  
 RECESSED 2X4 LUMINAIRE, MODEL  
 #PP4242ESDC12B1 SILVER REFLECTOR, (2)  
 #F40T12/WW LAMPS, (1) ADVANCE R - 2540  
 BALLAST, 12 - CELL SEMI - SPECULAR 3"  
 DEEP LOUVER, LUMEN RATING = 3200.

- Code gauge steel
- 6" deep troffer
- 3" 12 - cell semi - specular parabolic bower
- Energy saver ballast
- (2) F40T12 lamps
- 3 - piece specular silver reflector with lablock fastening
- 2'X4'

# Model #PP4242OEDC12B1

#9655 - PARKE POWERLITE 4 SERIES - RECESSED  
 2X4 LUMINAIRE, MODEL #PP4242OEDC12B1,  
 SILVER REFLECTOR, (2) GE F032SP41 32 -  
 WATT T8 LAMPS, (1) TRIAD R321120 ELEC-  
 TRONIC BALLAST, 12 - CELL SEMI - SPECULAR  
 3" DEEP LOUVER, LUMEN RATING = 2950.

- Code gauge steel
- 3" 12 - cell semi - specular parabolic bower
- Electronic ballast
- (2) T8 lamps
- 3 - piece specular silver reflector with lablock fastening
- 2'X4'

# Model #PP4222BXDC09B1

#1918A - PARKE POWERLITE 4 SERIES - 2X2  
 LUMINAIRE, MODEL #PP4222BXDC09B1,  
 SILVER REFLECTOR, (2) GE F040X25FX35RS,  
 1 BALLAST, 9 - CELL SEMI - SPECULAR 3"  
 DEEP LOUVER, LUMEN RATING = 3150.

- Code gauge steel
- 3" 9 - cell semi - specular bower
- Blax magnetic ballast
- (2) F40 BX lamp
- 3 - piece specular silver reflector with lablock fastening
- 2'X2'

PARKE INDUSTRIES INC.

TOTAL LUMENS AND PERCENTAGES	
ZONE	LUMENS
0.30	1671
0.40	2168
0.50	2612
0.60	3012
0.70	3372
0.80	3692
0.90	3972
1.00	4212
1.10	4412
1.20	4572
1.30	4702
1.40	4802
1.50	4872
1.60	4922
1.70	4952
1.80	4972
1.90	4982
2.00	4992
2.10	5002
2.20	5012
2.30	5022
2.40	5032
2.50	5042
2.60	5052
2.70	5062
2.80	5072
2.90	5082
3.00	5092
3.10	5102
3.20	5112
3.30	5122
3.40	5132
3.50	5142
3.60	5152
3.70	5162
3.80	5172
3.90	5182
4.00	5192
4.10	5202
4.20	5212
4.30	5222
4.40	5232
4.50	5242
4.60	5252
4.70	5262
4.80	5272
4.90	5282
5.00	5292
5.10	5302
5.20	5312
5.30	5322
5.40	5332
5.50	5342
5.60	5352
5.70	5362
5.80	5372
5.90	5382
6.00	5392
6.10	5402
6.20	5412
6.30	5422
6.40	5432
6.50	5442
6.60	5452
6.70	5462
6.80	5472
6.90	5482
7.00	5492
7.10	5502
7.20	5512
7.30	5522
7.40	5532
7.50	5542
7.60	5552
7.70	5562
7.80	5572
7.90	5582
8.00	5592
8.10	5602
8.20	5612
8.30	5622
8.40	5632
8.50	5642
8.60	5652
8.70	5662
8.80	5672
8.90	5682
9.00	5692
9.10	5702
9.20	5712
9.30	5722
9.40	5732
9.50	5742
9.60	5752
9.70	5762
9.80	5772
9.90	5782
10.00	5792
10.10	5802
10.20	5812
10.30	5822
10.40	5832
10.50	5842
10.60	5852
10.70	5862
10.80	5872
10.90	5882
11.00	5892
11.10	5902
11.20	5912
11.30	5922
11.40	5932
11.50	5942
11.60	5952
11.70	5962
11.80	5972
11.90	5982
12.00	5992
12.10	6002
12.20	6012
12.30	6022
12.40	6032
12.50	6042
12.60	6052
12.70	6062
12.80	6072
12.90	6082
13.00	6092
13.10	6102
13.20	6112
13.30	6122
13.40	6132
13.50	6142
13.60	6152
13.70	6162
13.80	6172
13.90	6182
14.00	6192
14.10	6202
14.20	6212
14.30	6222
14.40	6232
14.50	6242
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14.90	6282
15.00	6292
15.10	6302
15.20	6312
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15.40	6332
15.50	6342
15.60	6352
15.70	6362
15.80	6372
15.90	6382
16.00	6392
16.10	6402
16.20	6412
16.30	6422
16.40	6432
16.50	6442
16.60	6452
16.70	6462
16.80	6472
16.90	6482
17.00	6492
17.10	6502
17.20	6512
17.30	6522
17.40	6532
17.50	6542
17.60	6552
17.70	6562
17.80	6572
17.90	6582
18.00	6592
18.10	6602
18.20	6612
18.30	6622
18.40	6632
18.50	6642
18.60	6652
18.70	6662
18.80	6672
18.90	6682
19.00	6692
19.10	6702
19.20	6712
19.30	6722
19.40	6732
19.50	6742
19.60	6752
19.70	6762
19.80	6772
19.90	6782
20.00	6792
20.10	6802
20.20	6812
20.30	6822
20.40	6832
20.50	6842
20.60	6852
20.70	6862
20.80	6872
20.90	6882
21.00	6892
21.10	6902
21.20	6912
21.30	6922
21.40	6932
21.50	6942
21.60	6952
21.70	6962
21.80	6972
21.90	6982
22.00	6992
22.10	7002
22.20	7012
22.30	7022
22.40	7032
22.50	7042
22.60	7052
22.70	7062
22.80	7072
22.90	7082
23.00	7092
23.10	7102
23.20	7112
23.30	7122
23.40	7132
23.50	7142
23.60	7152
23.70	7162
23.80	7172
23.90	7182
24.00	7192
24.10	7202
24.20	7212
24.30	7222
24.40	7232
24.50	7242
24.60	7252
24.70	7262
24.80	7272
24.90	7282
25.00	7292
25.10	7302
25.20	7312
25.30	7322
25.40	7332
25.50	7342
25.60	7352
25.70	7362
25.80	7372
25.90	7382
26.00	7392
26.10	7402
26.20	7412
26.30	7422
26.40	7432
26.50	7442
26.60	7452
26.70	7462
26.80	7472
26.90	7482
27.00	7492
27.10	7502
27.20	7512
27.30	7522
27.40	7532
27.50	7542
27.60	7552
27.70	7562
27.80	7572
27.90	7582
28.00	7592
28.10	7602
28.20	7612
28.30	7622
28.40	7632
28.50	7642
28.60	7652
28.70	7662
28.80	7672
28.90	7682
29.00	7692
29.10	7702
29.20	7712
29.30	7722
29.40	7732
29.50	7742
29.60	7752
29.70	7762
29.80	7772
29.90	7782
30.00	7792
30.10	7802
30.20	7812
30.30	7822
30.40	7832
30.50	7842
30.60	7852
30.70	7862
30.80	7872
30.90	7882
31.00	7892
31.10	7902
31.20	7912
31.30	7922
31.40	7932
31.50	7942
31.60	7952
31.70	7962
31.80	7972
31.90	7982
32.00	7992
32.10	8002
32.20	8012
32.30	8022
32.40	8032
32.50	8042
32.60	8052
32.70	8062
32.80	8072
32.90	8082
33.00	8092
33.10	8102
33.20	8112
33.30	8122
33.40	8132
33.50	8142
33.60	8152
33.70	8162
33.80	8172
33.90	8182
34.00	8192
34.10	8202
34.20	8212
34.30	8222
34.40	8232
34.50	8242
34.60	8252
34.70	8262
34.80	8272
34.90	8282
35.00	8292
35.10	8302
35.20	8312
35.30	8322
35.40	8332
35.50	8342
35.60	8352
35.70	8362
35.80	8372
35.90	8382
36.00	8392
36.10	8402
36.20	8412
36.30	8422
36.40	8432
36.50	8442
36.60	8452
36.70	8462
36.80	8472
36.90	8482
37.00	8492
37.10	8502
37.20	8512
37.30	8522
37.40	8532
37.50	8542
37.60	8552
37.70	8562
37.80	8572
37.90	8582
38.00	8592
38.10	8602
38.20	8612
38.30	8622
38.40	8632
38.50	8642
38.60	8652
38.70	8662
38.80	8672
38.90	8682
39.00	8692
39.10	8702
39.20	8712
39.30	8722
39.40	8732
39.50	8742
39.60	8752
39.70	8762
39.80	8772
39.90	8782
40.00	8792
40.10	8802
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40.30	8822
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40.50	8842
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40.70	8862
40.80	8872
40.90	8882
41.00	8892
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41.90	8982
42.00	8992
42.10	9002
42.20	9012
42.30	9022
42.40	9032
42.50	9042
42.60	9052
42.70	9062
42.80	9072
42.90	9082
43.00	9092
43.10	9102
43.20	9112
43.30	9122
43.40	9132
43.50	9142
43.60	9152
43.70	9162
43.80	9172
43.90	9182
44.00	9192
44.10	9202
44.20	9212
44.30	9222
44.40	9232
44.50	9242
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44.70	9262
44.80	9272
44.90	9282
45.00	9292
45.10	9302
45.20	9312
45.30	9322
45.40	9332
45.50	9





**MOTOROLA**  
Lighting Inc.



3 LAMPS  
INPUT:  
120 VOLTS AC 60 Hz



**MOTOROLA**  
Lighting Inc.

**ELECTRONIC BALLAST RAPID START**  
MODEL NO. M3-RN-T12-1LL-120  
FOR SERVICE 1-800-MIL-0089  
BUFFALO GROVE, IL 60089

NO PCB'S

DISCONNECT POWER WHEN SERVICING

WIRE TAIL  
CONNECTOR

WHITE  
BLACK

LINE

RED  
YELLOW

LAMP



**MOTOROLA**  
Lighting Inc.

**ELECTRONIC BALLAST RAPID START**  
MODEL NO. M4-RN-T8-1LL-277  
FOR SERVICE 1-800-MIL-0089  
BUFFALO GROVE, IL 60089

NO PCB'S

DISCONNECT POWER WHEN SERVICING

WIRE TAIL  
CONNECTOR

WHITE  
BLACK

LINE

RED  
YELLOW

LAMP

BALLAST

LAMP

LAMP

LAMP

LAMP

LAMP

LAMP

LAMP

LAMP

LAMP

LAMP

LAMP

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LAMP

**HIGH PERFORMANCE  
ELECTRONIC BALLASTS**  
FLUORESCENT 1, 2, 3 and 4 LAMP  
RAPID START





**MOTOROLA**

Lighting Inc.

Total Customer Satisfaction

# CUSTOMER SUPPORT 1-800-MLI-0089

## HIGH PERFORMANCE FEATURES

Power Factor:	Greater than .99
Total Harmonic Distortion:	Less than 10%
Third Harmonic Distortion:	Less than 6%
Lamp Current Crest Factor:	Less than 1.5
Lamp Current Frequency:	Greater than 25 KHz
Lamp Configuration:	Series
Lamp Flicker:	Less than 2%, Not Visible
Sound Rating:	Class A
Projected Life:	20 years plus
Connector:	Poke-in wire trap for 18 gauge (solid wire)
Weight:	1.2 lbs.
EMI:	Meets FCC Part 18, Subpart C

### CODES

UL Listed:	Class P
Transient Protection:	Meets ANSI C62.41, Cat. A (Formerly IEEE 587)

## WIRETRAP CONNECTOR

OUR UNIQUE POKE-IN  
CONNECTORS SIMPLIFY INSTALLATION  
AND SAVE TIME.



## PART NUMBER DESCRIPTION

MODEL NUMBER EXPLANATION					
MSE	4	R	N	T8	1LL
Model	4	Ballast	Ballast	Lamp	Ballast
Motorola Lighting Inc.	Electronic Ballast	Electronic Ballast	Electronic Ballast	Electronic Ballast	Electronic Ballast
Number of Lamps	4	Ballast	Ballast	Lamp	Ballast
Lamps Operated	4	Ballast	Ballast	Lamp	Ballast
Light Output	4	Ballast	Ballast	Lamp	Ballast
Light Level	4	Ballast	Ballast	Lamp	Ballast
Full Light Output	4	Ballast	Ballast	Lamp	Ballast
120					

## QUALITY

Motorola's goal of acceptable quality is at Six Sigma or no more than 3.4 defects per million opportunities. Motorola Lighting Inc. designed its electronic ballast to meet the most rigorous performance standards at world class levels. This translates into a highly robust product that goes through extensive environmental stress testing to assure our customers of very low initial defect levels (less than 0.1%) and high reliability (greater than 500,000 hours Mean Time to Failure—MTTF).

The economic ballast life is 20 years when operated at 45°C ambient temperature. Operation of MLI's ballast at 50°C may derate life expectancy by 25%.

Six Sigma Quality means "world class" in all that we do at Motorola Lighting Inc., which is part of our commitment to TOTAL CUSTOMER SATISFACTION.





# RAPID START BALLASTS

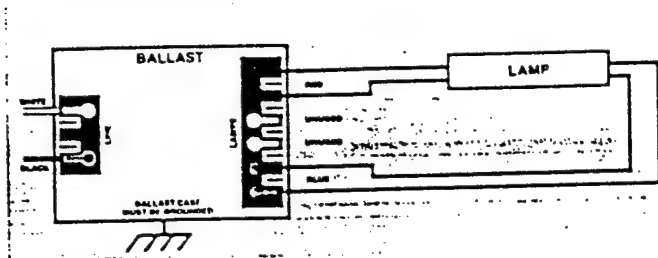
Lamp Type	Rated Lamp Wattage (W)	Lamp Length (FT)	Model No.	Line Voltage (V)	Max Line Current (A)	Typical Line Current (A)	Typical Input Power (W)		Min. Starting Temp (F)
							Open	Enclosed	
1 LAMP T8									
F32T8	32	4	M1-RN-T8-1LL-120	120	.31	.24	29	28	50*
F32T8	32	4	M1-RN-T8-1LL-277	277	.13	.11	29	28	50*
F25T8	25	3	M1-RN-T8-1LL-120	120	.24	.19	23	22	50*
F25T8	25	3	M1-RN-T8-1LL-277	277	.10	.08	23	22	50*
F17T8	17	2	M1-RN-T8-1LL-120	120	.17	.13	16	15	50*
F17T8	17	2	M1-RN-T8-1LL-277	277	.07	.08	16	15	50*
2 LAMP T8									
F32T8	32	4	M2-RN-T8-1LL-120	120	.55	.51	61	58	50*
F32T8	32	4	M2-RN-T8-1LL-277	277	.24	.21	59	56	50*
F25T8	25	3	M2-RN-T8-1LL-120	120	.42	.40	48	45	50*
F25T8	25	3	M2-RN-T8-1LL-277	277	.18	.17	46	44	50*
F17T8	17	2	M2-RN-T8-1LL-120	120	.27	.24	32	29	50*
F17T8	17	2	M2-RN-T8-1LL-277	277	.12	.10	34	31	50*
2 LAMP T12									
F40T12	40	4	M2-RN-T12-1LL-120	120	.64	.59	71	69	50*
F40T12	40	4	M2-RN-T12-1LL-277	277	.27	.25	69	67	50*
F40T12	34	4	M2-RN-T12-1LL-120	120	.54	.50	60	59	60*
F40T12	34	4	M2-RN-T12-1LL-277	277	.23	.21	58	57	60*
F40T10	40	4	M2-RN-T12-1LL-120	120	.64	.60	72	71	50*
F40T10	40	4	M2-RN-T12-1LL-277	277	.27	.25	70	69	50*
F30T12	30	3	M2-RN-T12-1LL-120	120	.48	.44	53	52	50*
F30T12	30	3	M2-RN-T12-1LL-277	277	.21	.19	52	50	50*
F30T12	25	3	M2-RN-T12-1LL-120	120	.40	.37	44	43	60*
F30T12	25	3	M2-RN-T12-1LL-277	277	.17	.16	43	42	60*
3 LAMP T8									
F32T8	32	4	M3-RN-T8-1LL-120	120	.78	.76	90	87	50*
F32T8	32	4	M3-RN-T8-1LL-277	277	.33	.32	89	85	50*
F25T8	25	3	M3-RN-T8-1LL-120	120	.61	.59	70	67	50*
F25T8	25	3	M3-RN-T8-1LL-277	277	.26	.25	69	66	50*
F17T8	17	2	M3-RN-T8-1LL-120	120	.39	.35	47	44	50*
F17T8	17	2	M3-RN-T8-1LL-277	277	.16	.14	44	41	50*
3 LAMP T12									
F40T12	40	4	M3-RN-T12-1LL-120	120	.92	.90	107	105	50*
F40T12	40	4	M3-RN-T12-1LL-277	277	.45	.38	105	103	50*
F40T12	34	4	M3-RN-T12-1LL-120	120	.84	.77	91	89	60*
F40T12	34	4	M3-RN-T12-1LL-277	277	.41	.33	90	88	60*
F40T10	40	4	M3-RN-T12-1LL-120	120	.99	.92	109	107	50*
F40T10	40	4	M3-RN-T12-1LL-277	277	.48	.39	107	105	50*
F30T12	30	3	M3-RN-T12-1LL-120	120	.76	.67	80	78	50*
F30T12	30	3	M3-RN-T12-1LL-277	277	.37	.29	78	76	50*
F30T12	25	3	M3-RN-T12-1LL-120	120	.71	.57	67	65	60*
F30T12	25	3	M3-RN-T12-1LL-277	277	.35	.24	66	64	60*
4 LAMP T8									
F32T8	32	4	M4-RN-T8-1LL-120	120	1.04	1.02	121	118	50*
F32T8	32	4	M4-RN-T8-1LL-277	277	.44	.43	118	115	50*
F25T8	25	3	M4-RN-T8-1LL-120	120	.81	.80	95	91	50*
F25T8	25	3	M4-RN-T8-1LL-277	277	.35	.34	93	90	50*
F17T8	17	2	M4-RN-T8-1LL-120	120	.55	.49	67	64	50*
F17T8	17	2	M4-RN-T8-1LL-277	277	.22	.19	61	58	50*

Ballast Will Operate the U-Shaped Equivalents of the Above Lamps. Test Data from Independent Test Lab Available on Request from Factory.

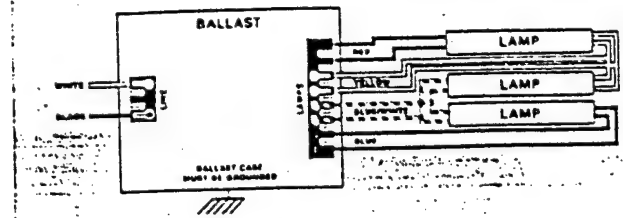


# WIRING DIAGRAMS AND BALLAST DIMENSIONS

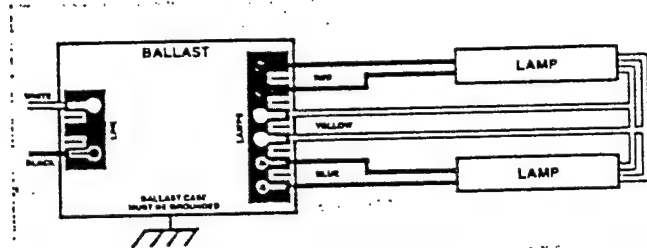
## WIRING DIAGRAMS



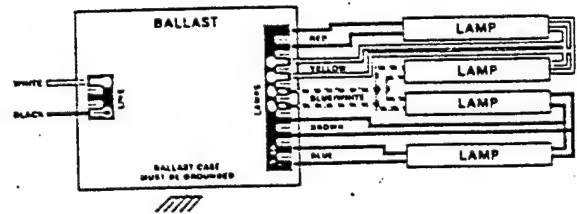
1 LAMP



3 LAMP

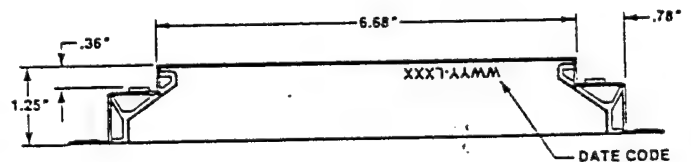
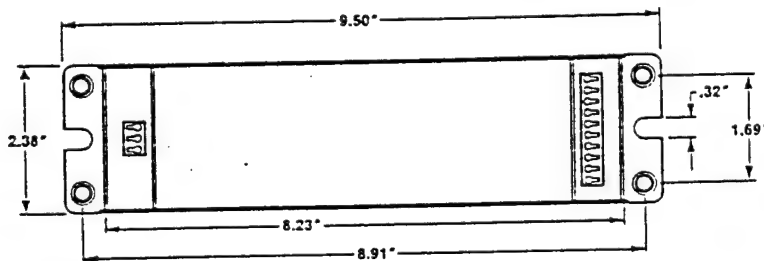


2 LAMP

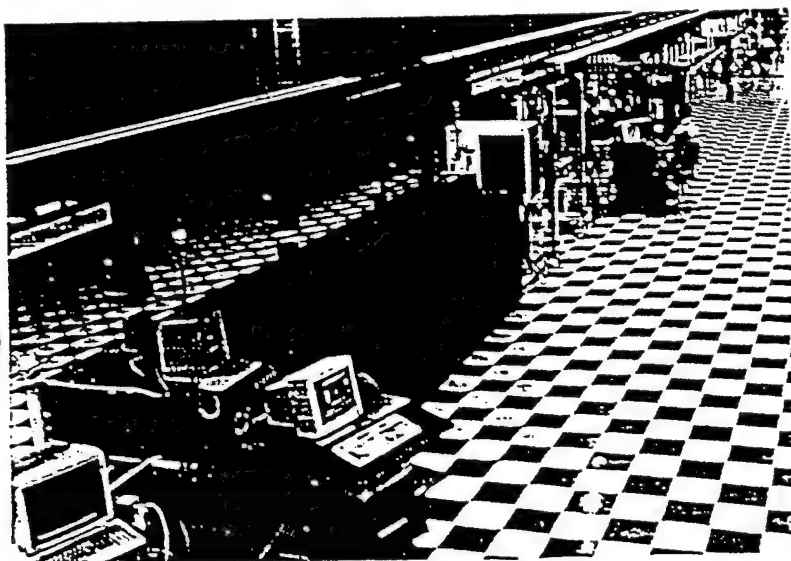


4 LAMP

## BALLAST DIMENSIONS\*



\*BALLAST IS SYMMETRICAL FOR MOUNTING PURPOSES



Our state-of-the-art manufacturing facility in Buffalo Grove, Illinois—in the U.S.A.



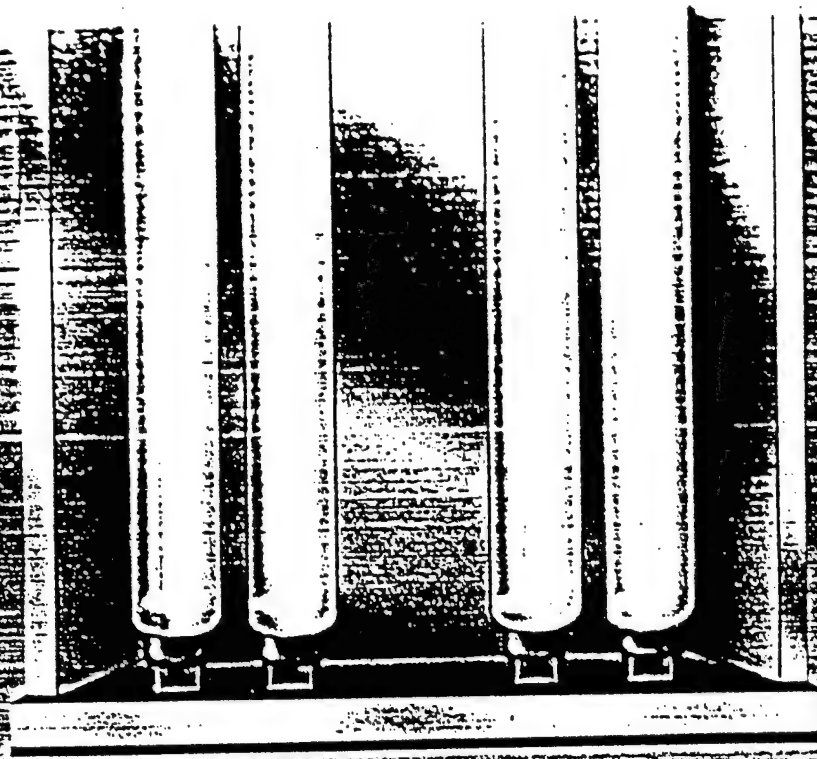
**MOTOROLA**  
Lighting Inc.

867 Deerfield Parkway  
Buffalo Grove, IL 60089  
1-800-MLI-0089

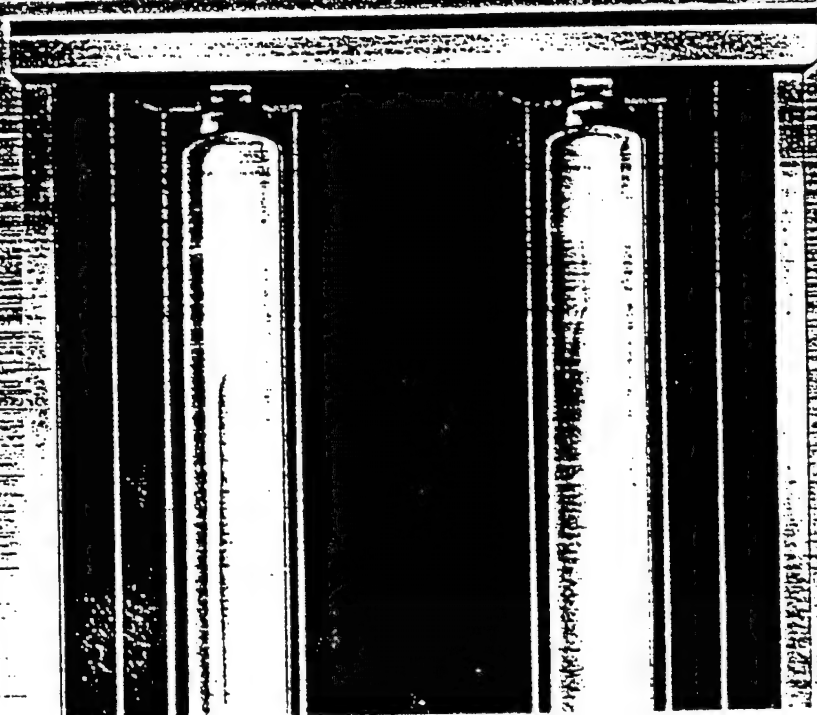
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Motorola is an Equal Employment  
Opportunity/Affirmative Action Employer





**SILVERLUX<sup>TM</sup>  
REFLECTORS  
CUT YOUR  
LIGHTING ENERGY  
COSTS IN HALF.**





# NOT YOUR LIGHTING LEVELS.

The energy saving outlook is bright. Shwartz reflectors, as they call them, are the most efficient lighting fixture you can buy. They are a "low cost" fixture. And when you add the number of fluorescent lamps that you can use on your energy costs, it's a real savings. Shwartz reflectors can actually deliver more light out of the same lamp—improving lighting levels and reducing energy costs. In fact, they can save you up to 30% on your lighting bills. The payback—short, usually less than two years.

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Front reflectivity maximizes lighting even more. Our patented front reflective surface construction allows light to be reflected more directly from the surface of the reflector to the lighting fixture. What's more, a special non-reflecting acrylic coating protects the lamp from degradation due to ultraviolet light. A second similar coating prevents the sheet from oxidizing or corroding. Result? Maximum performance over a long life.

Shwartz reflectors are easy to install and maintain. Lamps can be removed and fixtures refitted with no rewiring. All Shwartz reflectors become dry over time. Wet tests indicate that even without cleaning, Shwartz reflectors lose less than 3% of their reflectivity over a five-year period in normal office environments. Superior reflectivity can be maintained simply by cleaning reflectors with a mild 2% liquid detergent in warm water and wiping with a soft cloth or sponge. After cleaning, reflectors return to 99% of their original reflectivity.

We'll even help finance your program. Minnesota—A Division of 3M—provides financing for customers who invest in 3M products such as Shwartz reflectors. Because Minnesota's primary function is to make it easier for customers to buy 3M products, financing rates are kept as low as possible.

EXAMPLE: 7177 reflectors @ \$53 each installed = \$250,000. Amount financed = \$250,000. Term of agreement = 36 months. Payment period = 36 months. Monthly payment = \$8,110. Monthly energy savings = \$14,743. Net monthly savings = \$6,633.

These purchase plans are available at local monthly charges for periods ranging from one to three years. In effect, you're using your energy savings to pay for the installation. Just as important, your energy purchase—Shwartz reflectors, installation and service—can be handled by one person. Ask Minnesota for more information.

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# SILVERLUX FLUORESCENT REFLECTORS

- Cut energy costs in half or enhance lighting levels
- Pay for themselves in two years or less
- Install and maintain easily
- Warranted for 5 years
- Attractive low-rate financing available
- Available from nationwide dealer network

**For more information just call.**

3M is a part of the Green Lights Program—a voluntary, non-regulatory program organized by the Environmental Protection Agency (EPA). This program encourages corporations to take advantage of new lighting technologies and design principles that benefit the environment. 3M is a unique member of the program because it participates as both a consumer of electrical lighting energy and as a developer of electrical lighting products. Silverlux reflectors demonstrate 3M's commitment to energy-efficient lighting technologies that reduce energy consumption and pollution while delivering the same or better lighting.

**Cut costs, not lighting.**

**3M Construction Markets**

3M Center Bldg. 225-4S-08

St. Paul, MN 55144-1000

612-733-3333

Innovation working for you<sup>™</sup>  
3-622

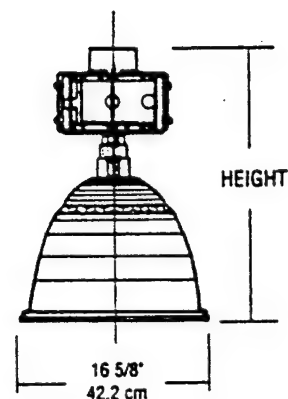
**3M**



# High-Bay Industrial Lighting

## ORDERING SEQUENCE

CATALOG NUMBER	VOLTAGE	OPTIONS (Factory Installed)
<input type="checkbox"/> THS 70S A18	<input type="checkbox"/> 120'	<b>Shipped Installed in Fixture</b>
<input type="checkbox"/> THS 100S A18	<input type="checkbox"/> 208	
<input type="checkbox"/> THS 150S A18	<input type="checkbox"/> 240	
	<input type="checkbox"/> 277'	



REFL. POS.	S/MH	HEIGHT
4	1.1	18 1/2"
3	1.29	18 1/4"
2	1.47	18"
0	1.77	17 1/2"

Weight: 70W 12lbs./5kg.  
100W 13lbs./6kg.  
150W 14lbs./6kg.

### NOTES:

- <sup>1</sup> May also be ordered with 5', 10', 15' cord lengths.
- <sup>2</sup> Multi-Tap Ballast (120,208,240,277V).
- <sup>3</sup> Quartz lamp wattage not to exceed ballast wattage rating. For 70W, use 100W quartz lamp.
- <sup>4</sup> May be ordered as accessory. MUST see Industrial Accessories Sheet for ordering information.
- <sup>5</sup> 36" cable to connect optical to remote ballast.
- <sup>6</sup> 20 amp standard 480V.
- <sup>7</sup> Provided with dual tap (120/277V) ballast when ordered as 120V or 277V, except w/MRB option.

For Complete Description & Application Information, See Options & Accessories Sheet I-Q/A.

- ☐ SF Single Fuse (120,277V) n/a TB
- ☐ DF Double Fuse (208,240,480V) n/a TB
- ☐ EC Emergency Circuit (lamp not included)
- ☐ QRS<sup>3</sup> Quartz Restrike System (lamp not included)
- ☐ QRSTD<sup>3</sup> QRS Time Delay (lamp not included)
- ☐ HA 65°C Ambient Operation
- ☐ CR Corrosion Resistant Finish (polyester)
- ☐ TOB Thru-Wire Outlet Box
- ☐ TOBP Thru-Wire Outlet Box Plug-in
- ☐ PBP Pendant Box Plug-in
- ☐ LCPP Loop, Cord & Plug for TPH & PPH
- ☐ LC3P<sup>1,4</sup> Loop, 3' Cord & 15A NEMA Twist Lock Plug
- ☐ HC3P<sup>1,4</sup> Hook, 3' Cord & 15A NEMA Twist Lock Plug
- ☐ LRCA<sup>1</sup> Loop, 3' Cord & Reloc RCA Connector
- ☐ HRCA<sup>1</sup> Hook, 3' Cord & Reloc RCA Connector
- ☐ LUCP Loop Cord and Plug For UPM1
- ☐ LUCPSF LUCP w/Single Fuse (dead front) n/a TB
- ☐ LUCPDF LUCP w/Double Fuse (dead front) n/a TB
- ☐ UCP Universal Cable & Plug for UPM
- ☐ UCPSF UCP w/Single Fuse (dead front) n/a TB
- ☐ UCPDF UCP w/Double Fuse (dead front) n/a TB
- ☐ TR Remote Ballast
- ☐ TRCP<sup>3</sup> TR w/PreWired Cable
- ☐ MRB Magnetic Regulator Ballast (150 only)
- ☐ CWA Constant Wattage Autotransformer (150 only)

### Shipped Separately <sup>4</sup>

- ☐ HKM Fixture Hook - Male
- ☐ HKMG Grommetted Fixture Hook - Male
- ☐ LPM Fixture Loop - Male
- ☐ LPMG Grommetted Fixture Loop - Male
- ☐ TPH Thru-Wire Power Hook
- ☐ PPH Pendant Power Hook
- ☐ UPM Universal Power Module
- ☐ UPM1 UPM w/Hook Adapter Plate
- ☐ UPM2 UPM w/Wiring Block
- ☐ UPM3 UPM w/Hook Adapter Plate & Wiring Block
- ☐ WG Wire Guard
- ☐ LG Louver Guard
- ☐ DCY Cylinder Shade
- ☐ DSQ Square Shade
- ☐ DHX Hexagonal Shade

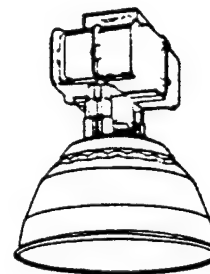
### ACCESSORIES (Field Installed) (order as separate line item)

Cat. No.	Description
MKF	Fixture Hook - Female
LPF	Fixture Loop - Female
SCK	Safety Chain Kit
TMB	Twin Mounting Bar (consult factory)

Fixture Type:

# THS

HIGH PRESSURE SODIUM  
70/100/150W  
12' to 20' Mounting



### SPECIFICATIONS

**HOUSING** - Rugged, lightweight, die-cast aluminum with dark bronze polyester powder finish. Electrical components are opposed horizontally and heat-sunk to ballast housing for cooler operation.

**BALLAST** - High reactance high power factor. 180° class H insulation system.

**OPTICS** - High efficiency, anodized, spun aluminum reflector features exclusive fluted design that minimizes arc-tube voltage rise for optimal lamp life. Optical system is fully adjustable and accommodates the full range of light distributions. Self-cleaning ventilated design carries optical contaminants out through the open top of the reflector.

**INSTALLATION** - Pendant splice box threaded for 3/4" conduit (standard). Complete line of mounting options and accessories available.

**LISTING** - UL 1572 listed -30°C to 55°C ambient operations & damp locations. 65°C available.

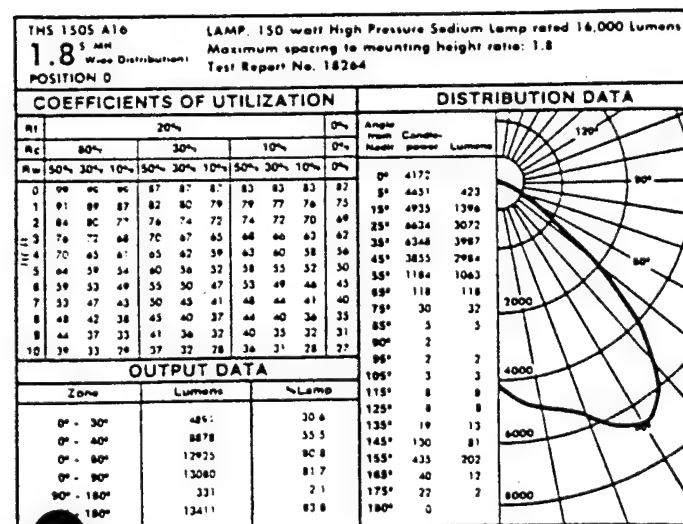
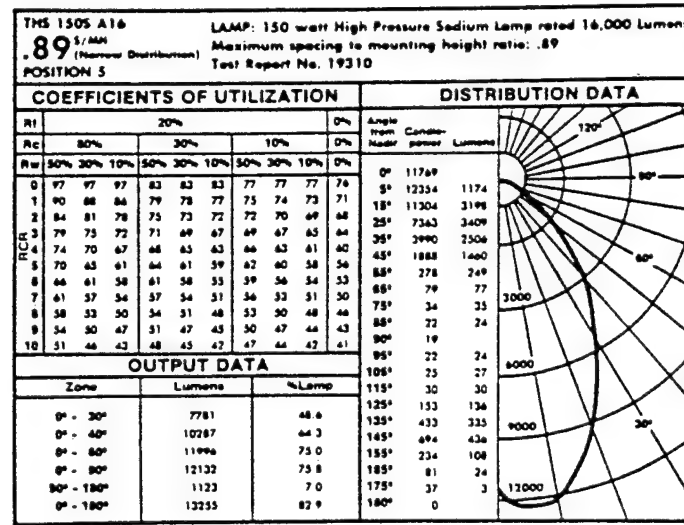
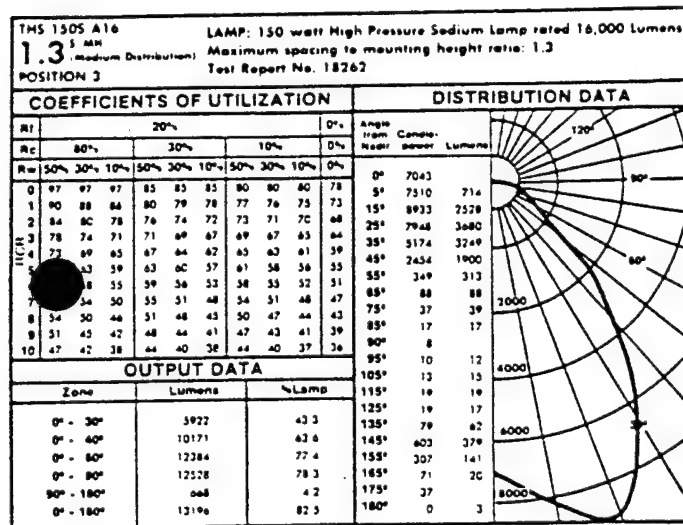
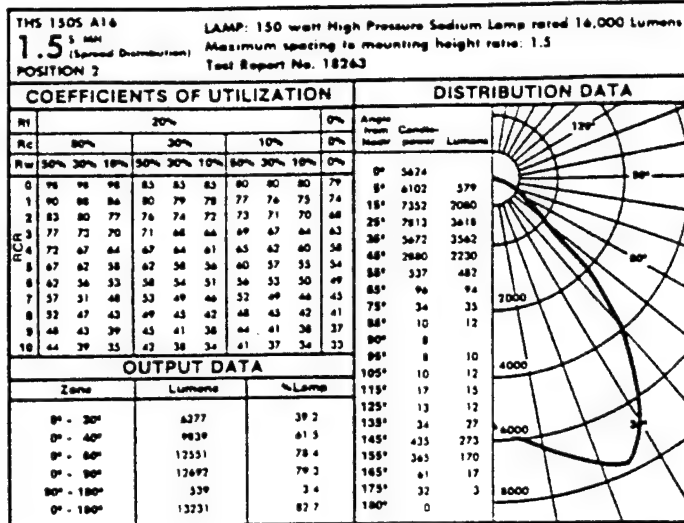
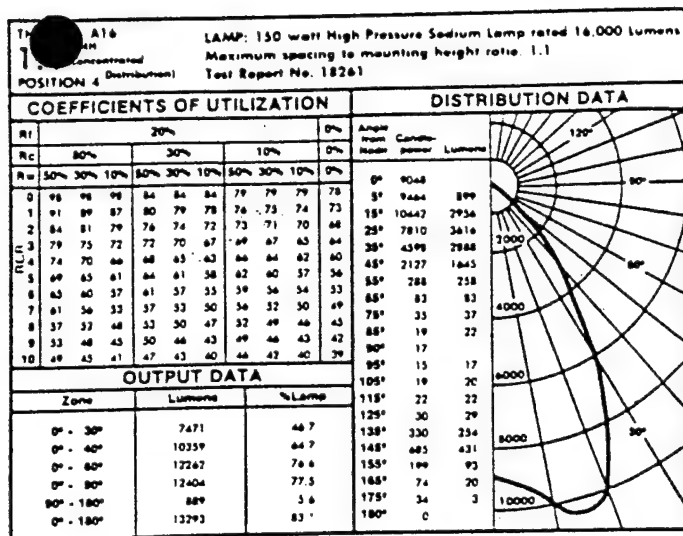
**SOCKET** - Porcelain, vertically oriented mogul base socket with copper alloy nickel plated screw shell and center contact. UL listed 1500W - 600 volt and 4 KV pulse rated.

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# PHOTOMETRIC DATA

The charts below provide the most useful data from photometric tests of specific lamp/luminaire combinations. For complete results of any combination shown, or other requirements, contact your LITHONIA/Hi-TEK representative.



## ELECTRICAL CHARACTERISTICS

WATTAGE/BALLAST	PRIMARY VOLTAGE	LINE CURRENT (AMPS) START/OPR	PRIMARY DROPOUT VOLTAGE	INPUT WATTS	POWER FACTOR (%)	REGULATION LINE V = LAMP (LUMENS)
70 HX-MPF	120	.75/.81	96	88	90+	± 5% ± 12%
	208	.47/.47	166			
	240	.40/.40	192			
	277	.35/.35	222			
100 HX-MPF	120	1.30/1.13	96	130	90+	± 5% ± 12%
	208	.74/.67	166			
	240	.64/.58	192			
	277	.60/.50	222			
150 HX-MPF	120	2.00/1.63	96	188	90+	± 5% ± 12%
	208	1.15/.95	166			
	240	1.00/.83	192			
	277	.85/.72	222			

Tested to current IES and NEMA standards under stabilized laboratory conditions. Various operating factors can cause differences between laboratory data and actual field measurements. Dimensions and specifications in catalog are based on the most current available data and are subject to change.

### CONVERSION FACTORS:

FROM	TO	FACTOR	LUMEN RATIO
150W	100W	.584	(9500/16,000)
150W	70W	.394	(8300/16,000)

\*These correction factors apply to luminaire distribution data only. Lamp lumen percentages and C.U. factors will not change regardless of wattage from values shown above.

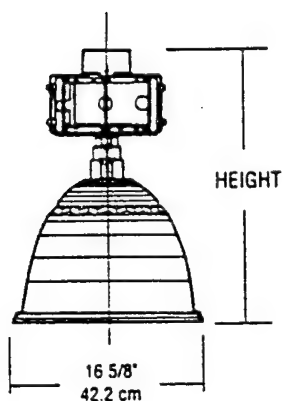
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# High-Bay Industrial Lighting

## ORDERING SEQUENCE

CATALOG NUMBER	VOLTAGE	OPTIONS (Factory Installed)
<input type="checkbox"/> THS 200S A16	<input type="checkbox"/> 120 <input type="checkbox"/> 208 <input type="checkbox"/> 240 <input type="checkbox"/> 277 <input type="checkbox"/> 480 <input type="checkbox"/> TB <sup>2</sup>	<input type="checkbox"/> SF Single Fuse (120,277V) n/a TB <input type="checkbox"/> DF Double Fuse (208,240,480V) n/a TB <input type="checkbox"/> EC Emergency Circuit (lamp not included) <input type="checkbox"/> QRS <sup>3</sup> Quartz Restrike System (lamp not included) <input type="checkbox"/> QRSTD <sup>3</sup> QRS Time Delay (lamp not included) <input type="checkbox"/> HA 65°C Ambient Operation <input type="checkbox"/> CR Corrosion Resistant Finish (polyester) <input type="checkbox"/> TOB Thru-Wire Outlet Box <input type="checkbox"/> TOBP Thru-Wire Outlet Box Plug-in <input type="checkbox"/> PBP Pendant Box Plug-In <input type="checkbox"/> LCPP Loop, Cord & Plug for TPH & PPH <input type="checkbox"/> LC3P <sup>1,4</sup> Loop, 3' Cord & 15A NEMA Twist Lock Plug <input type="checkbox"/> HC3P <sup>1,4</sup> Hook, 3' Cord & 15A NEMA Twist Lock Plug <input type="checkbox"/> LRCA <sup>1</sup> Loop, 3' Cord & Reloc RCA Connector <input type="checkbox"/> HRCA <sup>1</sup> Hook, 3' Cord & Reloc RCA Connector <input type="checkbox"/> LUCP Loop Cord and Plug for UPM1 <input type="checkbox"/> LUCPSF LUCP w/Single Fuse (dead front) n/a TB <input type="checkbox"/> LUCPDF LUCP w/Double Fuse (dead front) n/a TB <input type="checkbox"/> UCP Universal Cable & Plug for UPM <input type="checkbox"/> UCPSF UCP w/Single Fuse (dead front) n/a TB <input type="checkbox"/> UCPDF UCP w/Double Fuse (dead front) n/a TB <input type="checkbox"/> TR Remote Ballast <input type="checkbox"/> TRCP3 <sup>4</sup> TR w/Pre-Wired Cable



REFL. POS.	S/MH	HEIGHT
3	1.87	18 1/4" 46cm
5	1.50	18 3/4" 48cm
6	1.32	19" 48cm
7	1.13	19 1/4" 49cm

Weight: 14lbs./6kg.

### NOTES:

- May also be ordered with 5', 10', 15' cord lengths.
- Multi-Tap Ballast (120,208,240,277V).
- Quartz lamp wattage not to exceed ballast wattage rating.
- May be ordered as accessory. MUST see Industrial Accessories Sheet for ordering information.
- 36" cable to connect optical to remote ballast.
- 20 amp standard 480V.

For Complete Description & Application Information, See Options & Accessories Sheet I-O/A.

### Shipped Separately <sup>4</sup>

- ☐ HKM Fixture Hook - Male
- ☐ HKMG Grommetted Fixture Hook - Male
- ☐ LPM Fixture Loop - Male
- ☐ LPMG Grommetted Fixture Loop - Male
- ☐ TPH Thru-Wire Power Hook
- ☐ PPH Pendant Power Hook
- ☐ UPM Universal Power Module
- ☐ UPM1 UPM w/Hook Adapter Plate
- ☐ UPM2 UPM w/Wiring Block
- ☐ UPM3 UPM w/Hook Adapter Plate & Wiring Block
- ☐ WG Wire Guard
- ☐ LG Louver Guard
- ☐ DCY Cylinder Shade
- ☐ DSQ Square Shade
- ☐ DHX Hexagonal Shade

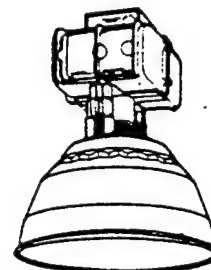
### ACCESSORIES (Field Installed) (order as separate line item)

Cat. No.	Description
HKF	Fixture Hook - Female
LPF	Fixture Loop - Female
SCK	Safety Chain Kit
TMB	Twin Mounting Bar (consult factory)

Fixture Type:

# THS

HIGH PRESSURE SODIUM  
200W  
12' to 20' Mounting



### SPECIFICATIONS

**HOUSING** - Rugged, lightweight, die-cast aluminum with dark bronze polyester powder finish. Electrical components are opposed horizontally and heat-sinked to ballast housing for cooler operation.

**BALLAST** - High power factor. Constant wattage autotransformer. 180° class H insulation system.

**OPTICS** - High efficiency, anodized, spun aluminum reflector features exclusive fluted design that minimizes arc-tube voltage rise for optimal lamp life. Optical system is fully adjustable and accommodates the full range of light distributions. Self-cleaning ventilated design carries optical contaminants out through the open top of the reflector.

**INSTALLATION** - Pendant splice box threaded for 3/4" conduit (standard). Complete line of mounting options and accessories available.

**LISTING** - UL 1572 listed -30°C to 55°C ambient operations & damp locations. 65°C available.

**SOCKET** - Porcelain, vertically oriented mogul base socket with copper alloy nickel plated screw shell and center contact. UL listed 1500W - 600V and 4 KV pulse rated.

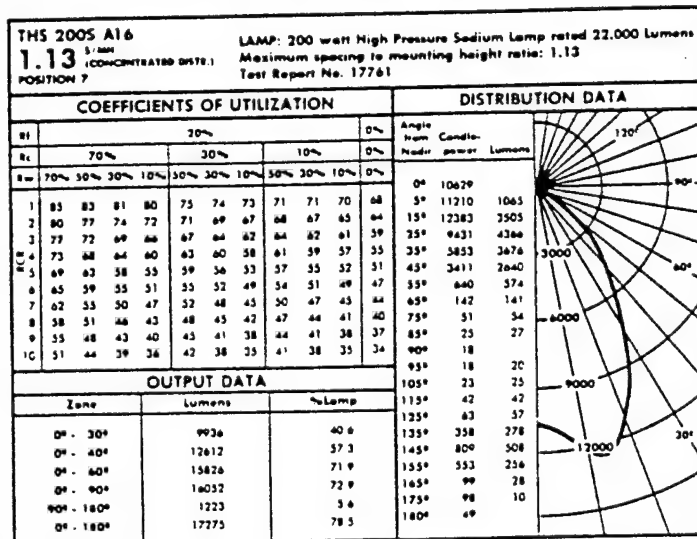
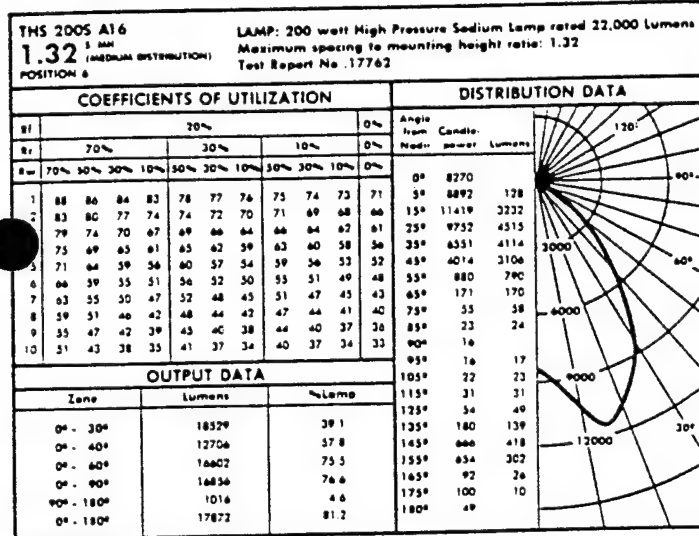
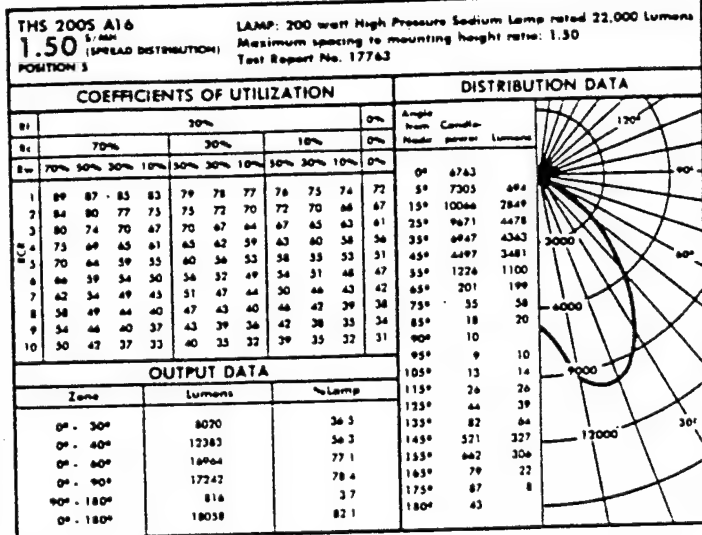
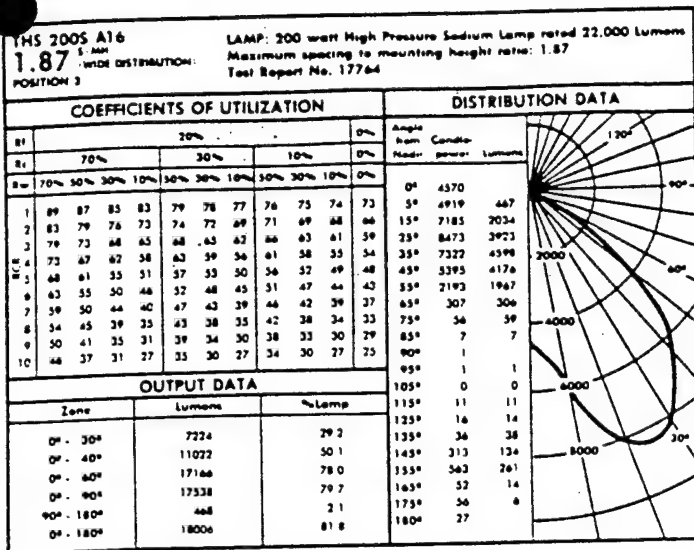
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THS S2



# PHOTOMETRIC DATA

The charts below provide the most useful data from specific photometric tests of the specific light sources and distribution patterns shown. For complete results of any combination shown, or other requirements, contact your HI-TEK/LITHONIA representative.



## ELECTRICAL CHARACTERISTICS

WATTAGE/BALLAST	PRIMARY VOLTAGE	LINE CURRENT (AMPS) START/OPR	PRIMARY DROPOUT VOLTAGE	INPUT WATTS	POWER FACTOR (%)	REGULATION LINE V - LAMP LUMENS
200 Auto-Regulator	120	1.35/2.22	90	245	90+	± 10% ± 10%
	208	.89/1.28	156			
	240	.78/1.11	180			
	277	.67/.96	208			
	480	.38/.56	360			

Tested to current IES and NEMA standards under stabilized laboratory conditions. Various operating factors can cause differences between laboratory data and actual field measurements. Dimensions and specifications in this catalog are based on the most current available data and are subject to change.



INDUSTRIAL OUTDOOR LIGHTING

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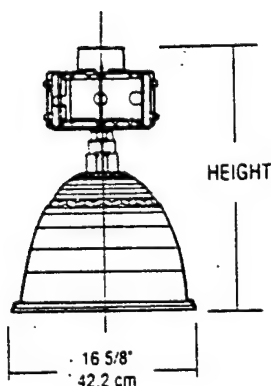
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# High-Bay Industrial Lighting

## ORDERING SEQUENCE

CATALOG NUMBER	VOLTAGE	OPTIONS (Factory Installed)
<input type="checkbox"/> THS 400S A16	<input type="checkbox"/> 120 <input type="checkbox"/> 208 <input type="checkbox"/> 240 <input type="checkbox"/> 277 <input type="checkbox"/> 480 <input type="checkbox"/> TB*	



REFL. POS.	S/MH	HEIGHT
3	1.95	18 1/4 46m
5	1.57	18 3/4 48cm
7	1.35	19' 48cm
10	1.14	19 1/2 49cm

Weight: 17lbs./8kg.

### NOTES:

- May also be ordered with 5', 10', 15' cord lengths.
- Multi-Tap Ballast (120,208,240,277V).
- Quartz lamp wattage not to exceed ballast wattage rating.
- May be ordered as accessory. MUST see Industrial Accessories Sheet for ordering information.
- 36" cable to connect optical to remote ballast.
- 20 amp standard 480V.

For Complete Description & Application Information, See Options & Accessories Sheet I-O/A.

### Shipped Installed In Fixture

- ☐ SF Single Fuse (120,277V) n/a TB
- ☐ DF Double Fuse (208,240,480V) n/a TB
- ☐ EC Emergency Circuit (lamp not included)
- ☐ QRS\* Quartz Restrike System (lamp not included)
- ☐ QRSTO\* QRS Time Delay (lamp not included)
- ☐ HA 65°C Ambient Operation
- ☐ CR Corrosion Resistant Finish (polyester)
- ☐ TOB Thru-Wire Outlet Box
- ☐ TOBP Thru-Wire Outlet Box Plug-in
- ☐ PBP Pendant Box Plug-in
- ☐ LCPP Loop, Cord & Plug for TPH & PPH
- ☐ LC3P1.6 Loop, 3' Cord & 15A NEMA Twist Lock Plug
- ☐ HC3P1.6 Hook, 3' Cord & 15A NEMA Twist Lock Plug
- ☐ LRCA' Loop, 3' Cord & Reloc RCA Connector
- ☐ HRCA' Hook, 3' Cord & Reloc RCA Connector
- ☐ LUCP Loop Cord and Plug For UPM1
- ☐ LUCPSF LUCP w/Single Fuse (dead front) n/a TB
- ☐ LUCPDF LUCP w/Double Fuse (dead front) n/a TB
- ☐ UCP Universal Cable & Plug for UPM
- ☐ UCPSF UCP w/Single Fuse (dead front) n/a TB
- ☐ UCPDF UCP w/Double Fuse (dead front) n/a TB
- ☐ TR Remote Ballast
- ☐ TRCP3\* TR w/Pre-Wired Cable
- ☐ MRB Magnetic Regulator Ballast

### Shipped Separately \*

- ☐ HKM Fixture Hook - Male
- ☐ HKMG Grommetted Fixture Hook - Male
- ☐ LPM Fixture Loop - Male
- ☐ LPMG Grommetted Fixture Loop - Male
- ☐ TPH Thru-Wire Power Hook
- ☐ PPH Pendant Power Hook
- ☐ UPM Universal Power Module
- ☐ UPM1 UPM w/Hook Adapter Plate
- ☐ UPM2 UPM w/Wiring Block
- ☐ UPM3 UPM w/Hook Adapter Plate & Wiring Block
- ☐ WG Wire Guard
- ☐ LG Louver Guard
- ☐ DCY Cylinder Shade
- ☐ DSQ Square Shade
- ☐ DHX Hexagonal Shade

### ACCESSORIES (Field Installed) (order as separate line item)

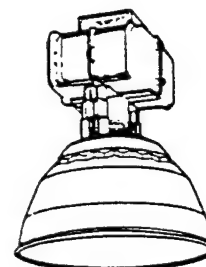
Cat. No.	Description
HKF	Fixture Hook - Female
LPF	Fixture Loop - Female
SCK	Safety Chain Kit
TMB	Twin Mounting Bar (consult factory)

Fixture Type:

# THS

## HIGH PRESSURE SODIUM 400W

### 20' to 30' Mounting



### SPECIFICATIONS

**HOUSING** - Rugged, lightweight, die-cast aluminum with dark bronze polyester powder finish. Electrical components are opposed horizontally and heat-sinked to ballast housing for cooler operation.

**BALLAST** - High power factor. Constant wattage autotransformer. 180° class H insulation system.

**OPTICS** - High efficiency, anodized, spun aluminum reflector features exclusive fluted design that minimizes arc-tube voltage rise for optimal lamp life. Optical system is fully adjustable and accommodates the full range of light distributions. Self-cleaning ventilated design carries optical contaminants out through the open top of the reflector.

**INSTALLATION** - Pendant splice box threaded for 3/4" conduit (standard). Complete line of mounting options and accessories available.

**LISTING** - UL 1572 listed -30°C to 55°C ambient operations & damp locations. 65°C available.

**SOCKET** - Porcelain, vertically oriented mogul base socket with copper alloy nickel plated screw shell and center contact. UL listed 1500W - 600V and 4 KV pulse rated.

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The charts below provide the most useful data from specific photometric tests of the specific light sources and distribution patterns shown. For complete results of any combination shown, or other requirements, contact your HI-TEK/LITHONIA representative.

TMS 400S A16

1.57

5.000

(SPECIES DISTRIBUTION)

POSITION 1

LAMP 400 watt High Pressure Sodium Lamp rated 50,000 Lumens

Maximum spacing to mounting height ratio: 1.37

Test Report No. 17345

COEFFICIENTS OF UTILIZATION

DISTRIBUTION DATA

BY	30°												0°
BY	70°				30°				10°				0°
BY	70°	30°	30°	10°	30°	30°	10°	30°	30°	10°	0°	0°	
1	94	91	89	87	84	82	81	81	79	78	77	77	0° 14853
2	88	84	80	77	78	76	73	73	73	72	70	13° 15211 1445	
3	83	77	72	69	72	69	66	70	67	64	63	25° 20064 5478	
4	78	70	65	61	64	63	59	64	61	58	57	35° 19978 9230	
5	72	64	59	54	61	56	53	59	56	52	51	45° 16218 10246	
6	67	59	53	49	56	51	48	54	50	47	46	55° 11968 9263	
7	62	53	47	43	50	46	42	49	45	42	40	65° 5664 5101	
8	56	48	42	38	46	41	38	45	41	37	36	75° 886 880	
9	54	44	38	34	42	37	33	41	36	33	32	85° 164 174	
10	49	40	34	30	38	33	30	37	33	30	28	90° 85° 23 25	

OUTPUT DATA

Zone	Lumens	% Lamp
0° - 30°	16373	32.7
0° - 40°	24621	53.2
0° - 60°	40983	82.0
0° - 90°	47064	94.1
90° - 180°	934	1.9
0° - 180°	43021	86.0

THS 400S A16

1.14<sup>5/1600</sup>  
(CONCENTRATED BEAM)

POSITION 7

LAMP: 400 watt High Pressure Sodium Lamp rated 30,000 Lumens

Maximum spacing to mounting height ratio: 1:14

Test Report No. 17243

COEFFICIENTS OF UTILIZATION

DISTRIBUTION DATA

RI	30%												0%	Angle Hood to Hood	Candle power lumens
RI	70%			30%			10%			0%			0%		
RI	70%	30%	10%	30%	30%	10%	30%	30%	10%	0%	0%	0%	0%		
1	93	93	91	89	84	83	82	81	80	79	77	75	74	73	71
2	89	85	82	79	79	77	75	74	74	73	71	69	67	65	63
3	85	79	75	71	74	71	68	71	69	67	65	63	61	59	57
4	80	73	69	65	69	65	63	67	64	61	60	58	56	54	52
5	75	68	62	58	64	60	57	62	59	56	54	52	50	48	46
6	70	62	58	54	59	55	52	58	54	51	50	48	46	44	42
7	64	58	52	48	54	50	47	53	49	46	45	43	41	39	37
8	62	52	47	43	50	46	43	49	45	42	41	39	37	35	33
9	58	49	43	40	47	42	39	45	41	38	37	35	33	31	29
10	54	43	40	36	42	38	35	42	38	35	34	32	30	28	26

OUTPUT DATA

Zone	Lumens	% Lamp
0° - 30°	19718	39.4
0° - 40°	29511	59.0
0° - 60°	40917	81.8
0° - 90°	41746	83.4
90° - 180°	1884	3.8
0° - 180°	43630	87.2

WATTAGE/BALLAST	PRIMARY VOLTAGE	LINE CURRENT (AMPS) START, OPER.	PRIMARY DROPOUT VOLTAGE	INPUT WATTS	POWER FACTOR (%)	REGULATION LINE V. LAMP CURRENT
	120	2.82/4.30	90			
	208	1.56/2.48	136			
400 Auto-Regulator	240	1.36/2.13	180	445	90+	+ 10% = - 10%
	277	1.18/1.84	208			
	480	.75/1.07	360			



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# Sportslight

## ORDERING SEQUENCE

CATALOG NUMBER DIST. VOLTAGE

OPTIONS (Factory Installed)

TV 400M			
✓	✓	✓	✓

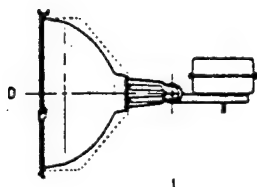
- |                              |  |
|------------------------------|--|
| <input type="checkbox"/> GP2 | <input type="checkbox"/> 120             |
| <input type="checkbox"/> GP3 | <input type="checkbox"/> 208             |
| <input type="checkbox"/> GP4 | <input type="checkbox"/> 240             |
| <input type="checkbox"/> GP5 | <input type="checkbox"/> 277             |
| <input type="checkbox"/> GP6 | <input type="checkbox"/> 480             |
|                              | <input type="checkbox"/> TB <sup>1</sup> |

### Shipped Installed in Fixture

- |                              |  |
|------------------------------|--|
| <input type="checkbox"/> SF  | Single Fuse (120,277V) n/a TB  |
| <input type="checkbox"/> DF  | Double Fuse (208,240,480V) n/a TB  |
| <input type="checkbox"/> QRS | Quartz Restrike System (lamp not included)                                     |
| <input type="checkbox"/> PER | NEMA PE Recept. only, No Photocell   |
| <input type="checkbox"/> LS  | Lamp Support   |
| <input type="checkbox"/> C62 | 2 Ft. of 16-3 SEO Cord Pre-Wired   |
| <input type="checkbox"/> C42 | 2 Ft. of 14-3 SEO Cord Pre-Wired   |
| <input type="checkbox"/> C22 | 2 Ft. of 12-3 SEO Cord Pre-Wired   |
| <input type="checkbox"/> AH  | Above Horizontal Aiming  |
| <input type="checkbox"/> DC  | Architectural Color - Specify Letter Code                                      |
| <input type="checkbox"/> CR  | Corrosion Resistant Finish (polyester)   |
| <input type="checkbox"/> CRT | Corrosion Resistant Finish (teflon)  |
| <input type="checkbox"/> CF  | Charcoal Filter (heavy duty only)  |
| <input type="checkbox"/> CH  | Die Cast Ballast Housing   |
| <input type="checkbox"/> HD  | Heavy-Duty Aluminum Shroud   |
| <input type="checkbox"/> SLR | Stainless Steel Lens Ring  |
| <input type="checkbox"/> WC  | Wood Cross Arm Mounting Bolt (5/8"-11" exposed length 6-3/4", total length 8") |

### Shipped Separately<sup>1</sup>

- |                              |  |
|------------------------------|--|
| <input type="checkbox"/> UV  | Upper Visor                                  |
| <input type="checkbox"/> PWB | Wood Pole/Wall Mounting Bracket              |
| <input type="checkbox"/> PMB | Pole Mounting Bracket                        |
| <input type="checkbox"/> SAB | Steel Angle Bracket for TV                   |
| <input type="checkbox"/> RAB | Right Angle Bracket for TV                   |
| <input type="checkbox"/> PE1 | NEMA Twist-Lock PE Photocontrol for 120-240V |
| <input type="checkbox"/> PE4 | NEMA Twist-Lock PE Photocontrol for 480V     |
| <input type="checkbox"/> PE7 | NEMA Twist-Lock PE Photocontrol for 277V     |
| <input type="checkbox"/> TS  | Tenon Slipfitter                             |



NEMA DISTR.	BEAM SPREAD
2	25° x 24°
3	43° x 42°
4	65° x 65°
5	86° x 86°
6	102° x 104°

Diameter Length

Used for all NEMA 2 & 3 distribution	23 1/8"	30"
Effective projected area: 2.9 sq. ft. .27 sq. meters	58.7cm	75cm
Used for all NEMA 4-5-6 distributions	21 1/2"	31.5"
Effective projected area: 2.5 sq. ft. .23 sq. meters	54.6cm	78.75cm

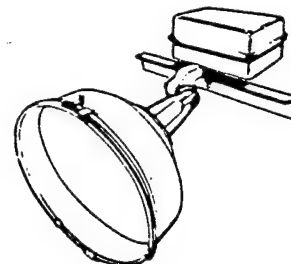
### ACCESSORIES (Field Installed) (order as separate line item)

Cat. No.	Description
TVX2	2 Light Wood Pole Cross-Arm (prime painted)
TVX3	3 Light Wood Pole Cross-Arm (prime painted)
TVX4	4 Light Wood Pole Cross-Arm (prime painted)
TVX2G	2 Light Wood Pole Cross-Arm (galvanized)
TVX3G	3 Light Wood Pole Cross-Arm (galvanized)
TVX4G	4 Light Wood Pole Cross-Arm (galvanized)

Fixture Type:

# TV

**METAL HALIDE**  
**400W**  
**20' to 40' Ft. Mounting**



### SPECIFICATIONS

**HOUSING** - Heavy gauge, hydroformed aluminum ballast housing is mounted to integral die-cast monoframe with horizontal degree aiming scale and repositioning locator. Die cast aluminum socket housing provides vertical aiming adjustment complete with degree aiming scale and repositioning stop.

**OPTICS** - Heavy gauge anodized aluminum reflectors provide a range of NEMA beamspreads. Optical chamber is sealed to inhibit entrance of contaminants. Hinged lens is heavy duty thermal shock-and-impact resistant tempered glass.

**ELECTRICAL** - All electrical components are contained in the ballast housing that is thermally isolated from the socket housing and optical assembly, promoting longer ballast life. Ballast, 100% copper wound and factory tested, is high power factor constant wattage autotransformer.

**INSTALLATION** - Fixture is mounted by securing the integral cross arm mounting bracket directly to the cross arm. No additional adaptors are required. A 5/8"-11 mounting bolt is provided. Exposed bolt length is 1- 1/2".

**LISTING** - UL 1572 listed, suitable for wet locations.

**SOCKET** - Adjustable mounting bracket standard. Porcelain mogul base socket with copper alloy nickel plated screw shell and center contact. UL listed 1500W - 600V, 4KV pulse rated.

**LITHONIA**  
**HI-TEK**  
INDUSTRIAL OUTDOOR LIGHTING  
A DIVISION OF LITHONIA LIGHTING

3-629 6/89  
TV M1

### Note:

- <sup>1</sup> May be ordered as an accessory.
- MUST see Flood Accessories Sheet for ordering information.
- <sup>2</sup> Multi-tap ballast (120, 208, 240, 277V).

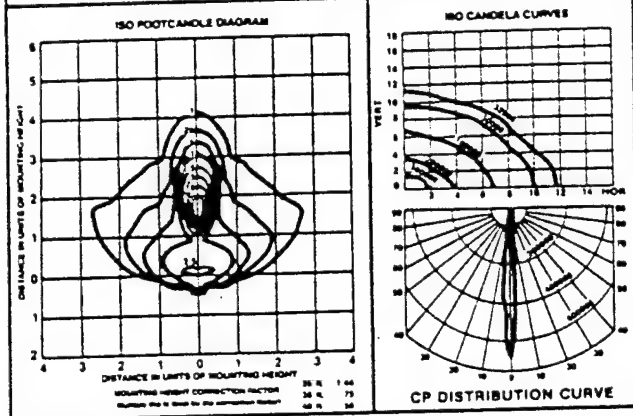


# PHOTOMETRIC DATA

The charts below provide the most useful data from photometric tests of specific lamp/luminaire combinations. For complete results of any combination shown, or other requirements, contact your LITHONIA/Hi-TEK representative.

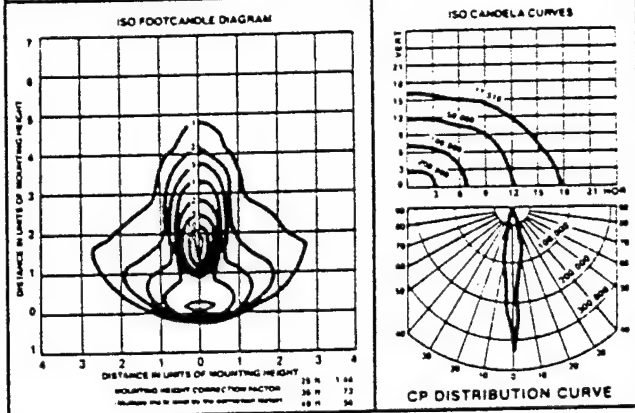
**TV 400M GP/HD2**  
Test Report No. 1185061104

LAMP: 400 watt Metal Halide Lamp rated 34,000 Lumens. Footcandle values based on 30' mounting height. AIMING ANGLE: 60°



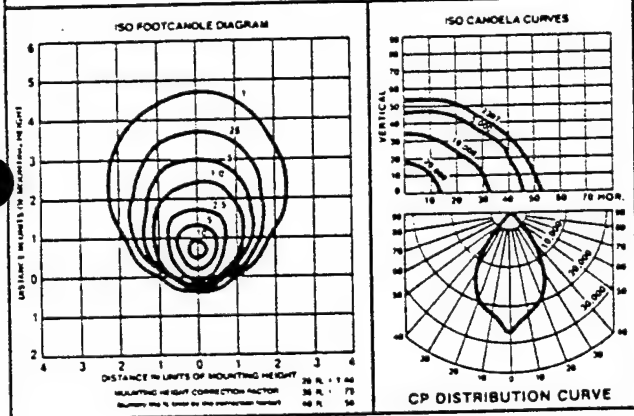
**TV 400M GP/HD3**  
Test Report No. 1185061102

LAMP: 400 watt Metal Halide Lamp rated 34,000 Lumens. Footcandle values based on 30' mounting height. AIMING ANGLE: 80°



**TV 400M GP/HD6**  
Test Report No. 11945

LAMP: 400 watt Metal Halide Lamp rated 34,000 Lumens. Footcandle values based on 30' mounting height. AIMING ANGLE: 45°



## ELECTRICAL CHARACTERISTICS

WATTAGE/BALLAST	PRIMARY VOLTAGE	LINE CURRENT (AMPS) START-UP/OPR.	PRIMARY DROPOUT VOLTAGE	INPUT WATTS	POWER FACTOR (%)	REGULATION LINE V. x LAMP LUMENS
400	120	2.30/4.00	30			
	208	1.40/2.30	86			
CWA	240	1.70/2.00	100	455	90+	+10% = -7%
Peak-Load	277	1.00/1.73	115			
	480	.60/1.00	200			

Tested to current IES and NEMA standards under stabilized laboratory conditions. Various operating factors can cause differences between laboratory and actual field measurements. Dimensions and specifications are based on the most current available data and are subject to change.



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**ULTRASONIC<sup>TM</sup>**  
PhaseArc DIMMING SYSTEM  
U.S. Patent # 4,612,478

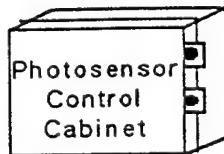
## PhaseArc Dimming & Control Systems

PROJECT NAME: Fort Knox Warehouse Project

### Systems Equipment:



Cat # RPS-A  
Payne-Sparkman Remote adjustable  
Photosensor, mounts in single gang  
jbox.

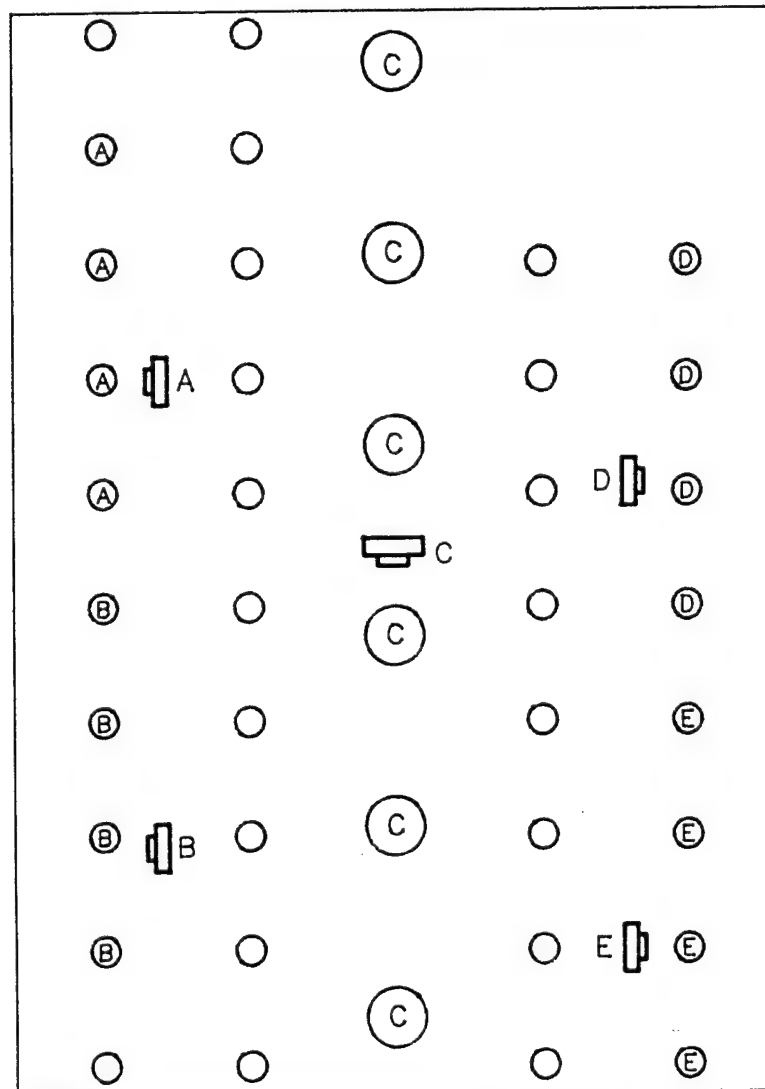


Cat # PCC-A-JB  
Payne-Sparkman Photosensor control  
cabinet prewired in NEMA 1 enclosure,  
with systems on/off contactors.  
(see plans for electrical details.)



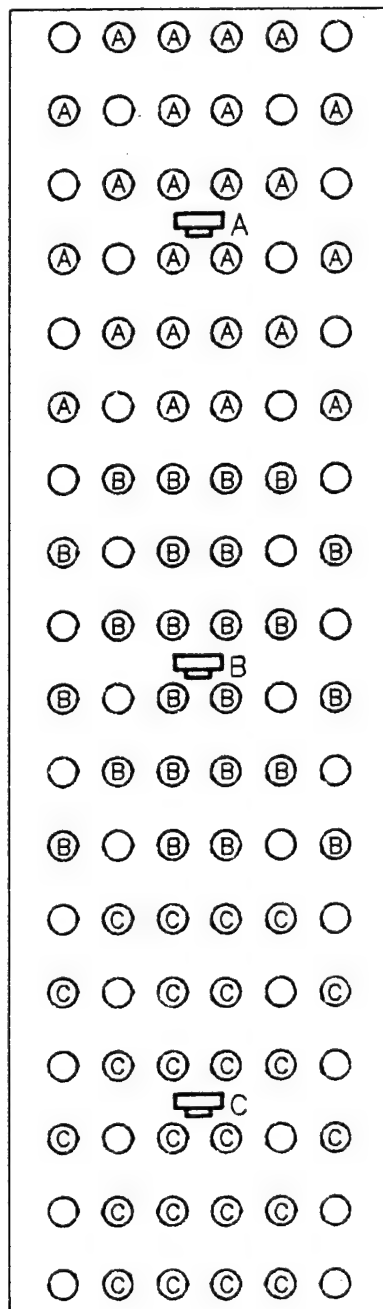
# FIGURE 3.1 PHOTOCELL CONTROL LAYOUT - BUILDING 86

LEGEND	
SYMBOL	DESCRIPTION
○	LIGHT; CONTROLLED BY MANUAL SWITCH ONLY
Ⓐ	LIGHT; LETTER INSIDE DESIGNATES CONTROLLING PHOTOCELL
▬ A	PHOTOCELL; LETTER DESIGNATES WHICH PHOTOCELL





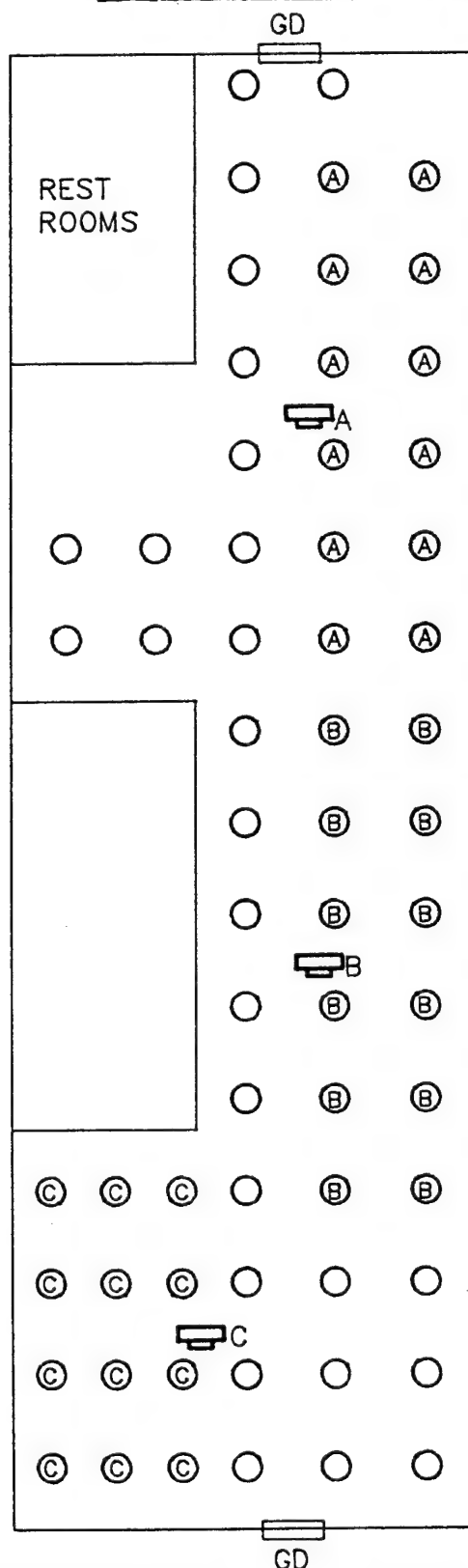
# FIGURE 3.2 PHOTOCELL CONTROL LAYOUT - BUILDING 94



LEGEND	
SYMBOL	DESCRIPTION
○	LIGHT; CONTROLLED BY MANUAL SWITCH ONLY
Ⓐ	LIGHT; LETTER INSIDE DESIGNATES CONTROLLING PHOTOCELL
▢ A	PHOTOCELL; LETTER DESIGNATES WHICH PHOTOCELL



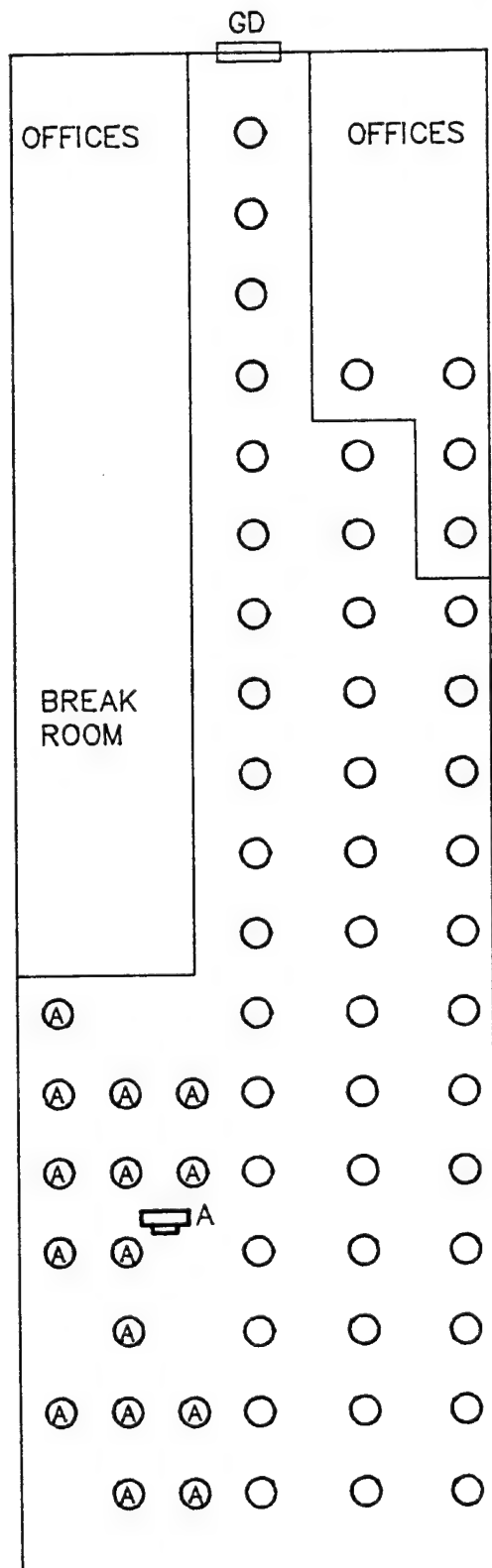
# FIGURE 3.3 PHOTOCELL CONTROL LAYOUT - BUILDING 158



LEGEND	
SYMBOL	DESCRIPTION
○	LIGHT; CONTROLLED BY MANUAL SWITCH ONLY
Ⓐ	LIGHT; LETTER INSIDE DESIGNATES CONTROLLING PHOTOCELL
☐ A	PHOTOCELL; LETTER DESIGNATES WHICH PHOTOCELL
☐ GD	GARAGE DOOR



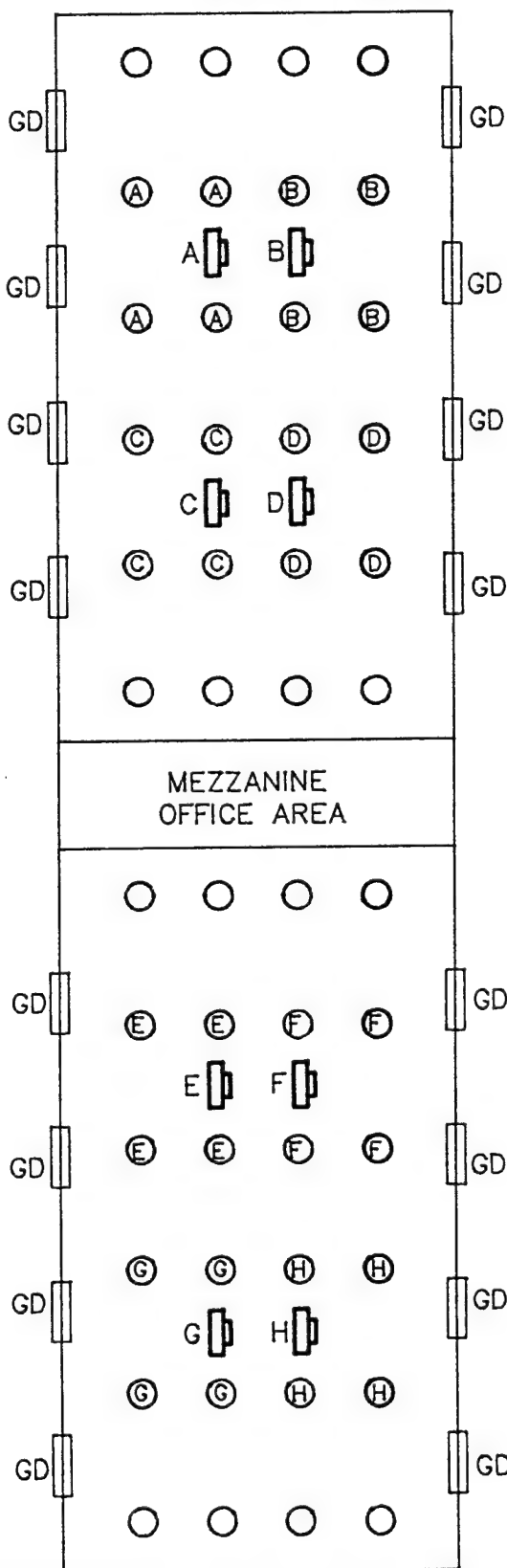
# FIGURE 3.4 PHOTOCELL CONTROL LAYOUT - BUILDING 159



LEGEND	
SYMBOL	DESCRIPTION
○	LIGHT; CONTROLLED BY MANUAL SWITCH ONLY
Ⓐ	LIGHT; LETTER INSIDE DESIGNATES CONTROLLING PHOTOCELL
▢ A	PHOTOCELL; LETTER DESIGNATES WHICH PHOTOCELL
GD ▢	GARAGE DOOR





# FIGURE 3.5 PHOTOCELL CONTROL LAYOUT - BUILDING 2730

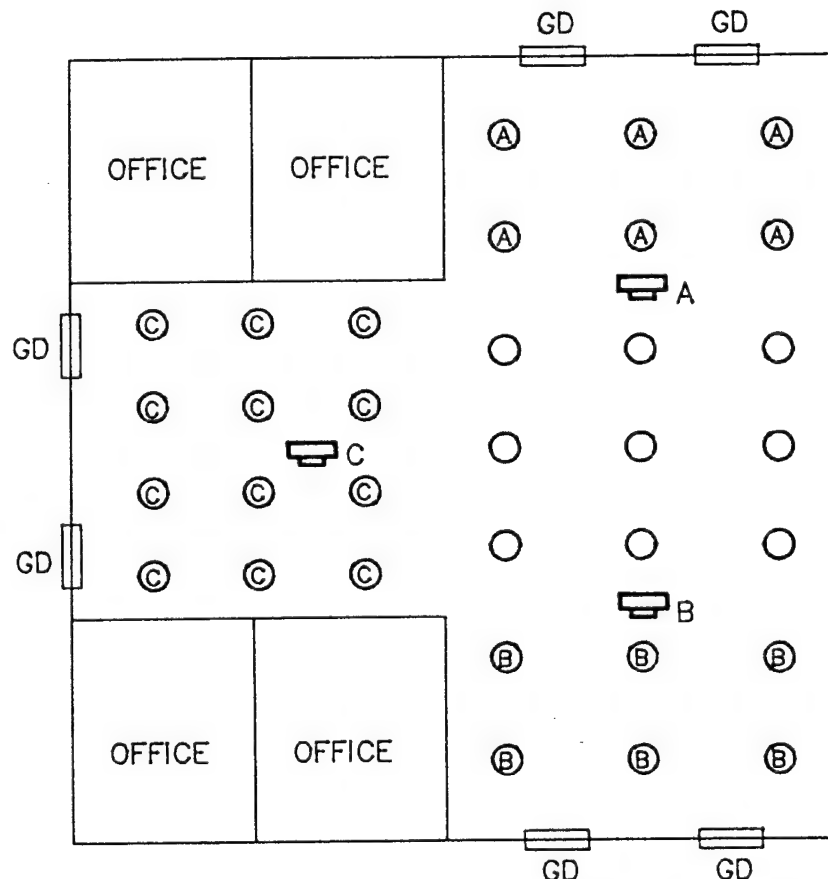


LEGEND	
SYMBOL	DESCRIPTION
○	LIGHT; CONTROLLED BY MANUAL SWITCH ONLY
Ⓐ	LIGHT; LETTER INSIDE DESIGNATES CONTROLLING PHOTOCELL
☐ A	PHOTOCELL; LETTER DESIGNATES WHICH PHOTOCELL
GD	GARAGE DOOR



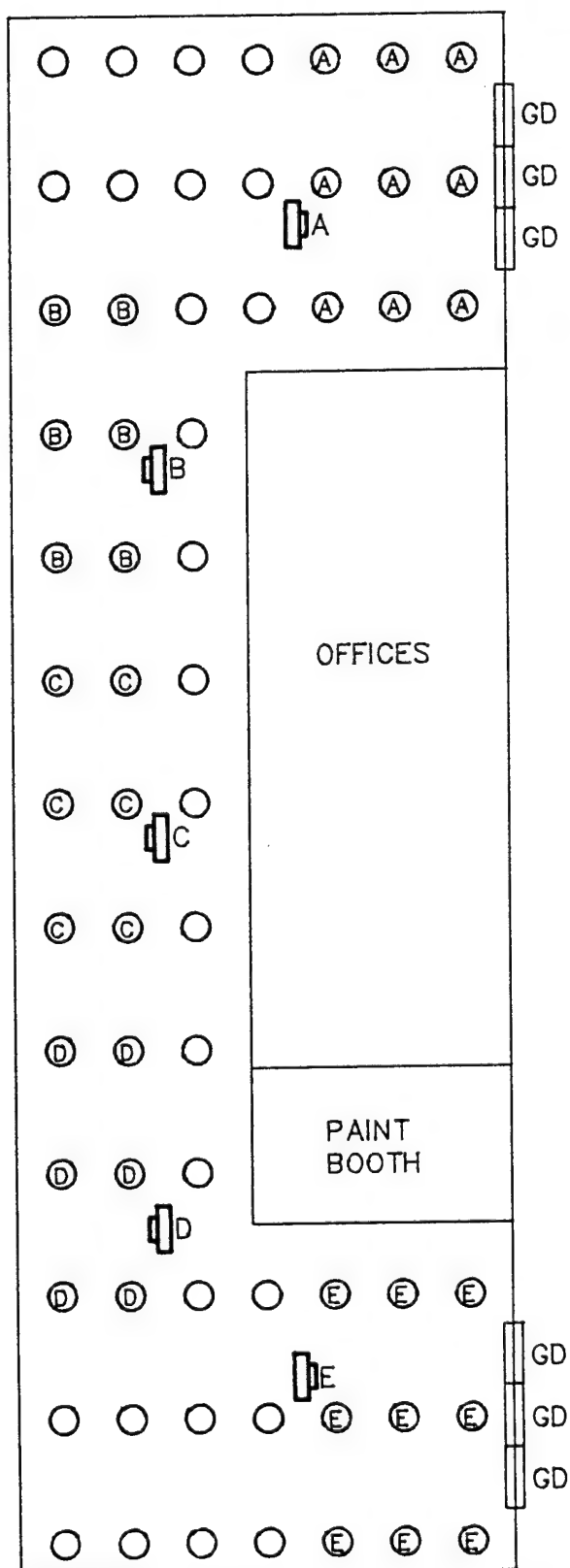
# FIGURE 3.6 PHOTOCELL CONTROL LAYOUT - BUILDINGS 2942 & 2943

LEGEND	
SYMBOL	DESCRIPTION
○	LIGHT; CONTROLLED BY MANUAL SWITCH ONLY
Ⓐ	LIGHT; LETTER INSIDE DESIGNATES CONTROLLING PHOTOCELL
 A	PHOTOCELL; LETTER DESIGNATES WHICH PHOTOCELL
 GD	GARAGE DOOR







# FIGURE 3.7 PHOTOCELL CONTROL LAYOUT - BUILDING 2944

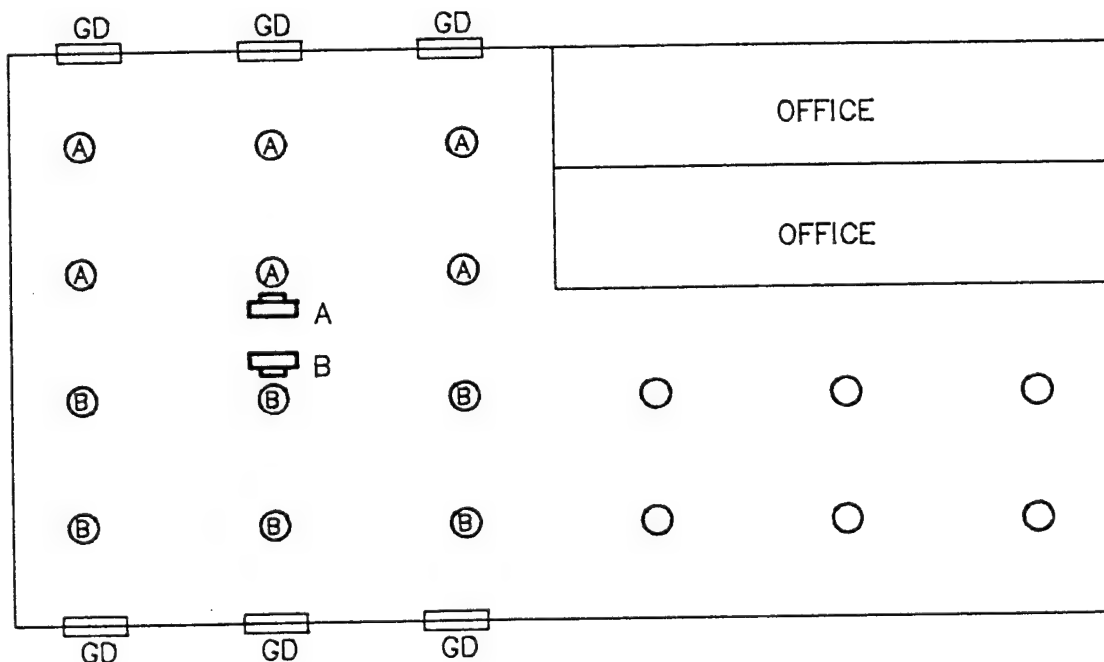


LEGEND	
SYMBOL	DESCRIPTION
○	LIGHT; CONTROLLED BY MANUAL SWITCH ONLY
Ⓐ	LIGHT; LETTER INSIDE DESIGNATES CONTROLLING PHOTOCELL
☐ A	PHOTOCELL; LETTER DESIGNATES WHICH PHOTOCELL
☐ GD	GARAGE DOOR



# FIGURE 3.8 PHOTOCELL CONTROL LAYOUT - BUILDINGS 2963, 2969, 2970, 2974, 2979, & 2980

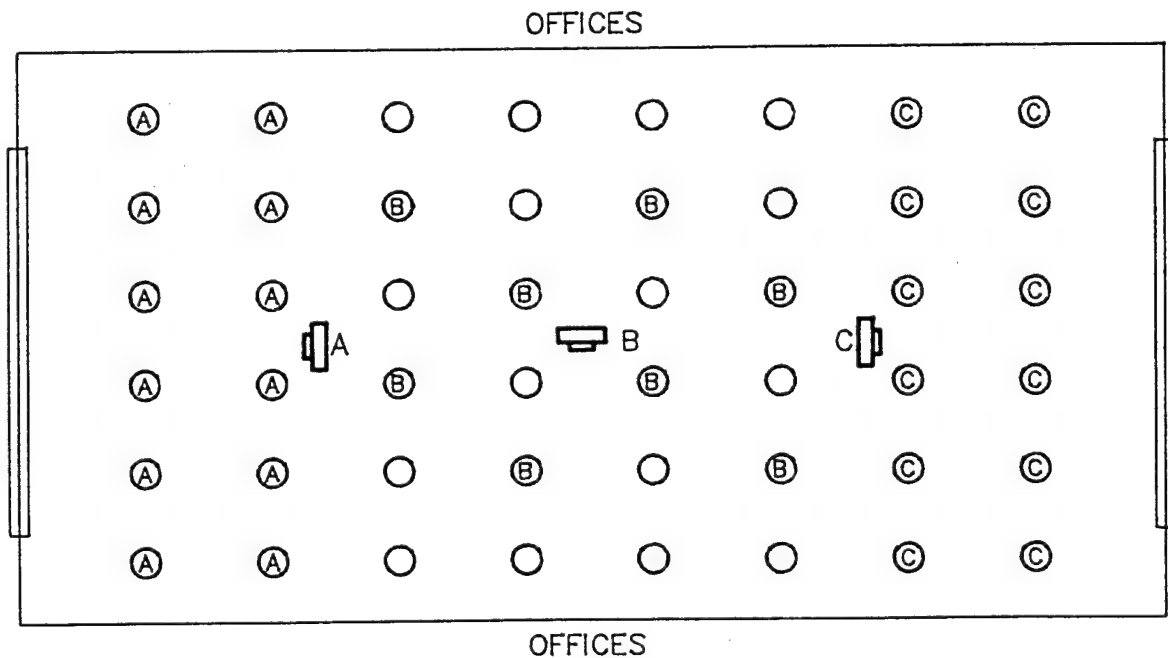
LEGEND	
SYMBOL	DESCRIPTION
○	LIGHT; CONTROLLED BY MANUAL SWITCH ONLY
Ⓐ	LIGHT; LETTER INSIDE DESIGNATES CONTROLLING PHOTOCELL
 A	PHOTOCELL; LETTER DESIGNATES WHICH PHOTOCELL
 GD	GARAGE DOOR







# FIGURE 3.9 PHOTOCELL CONTROL LAYOUT - BUILDING 5220

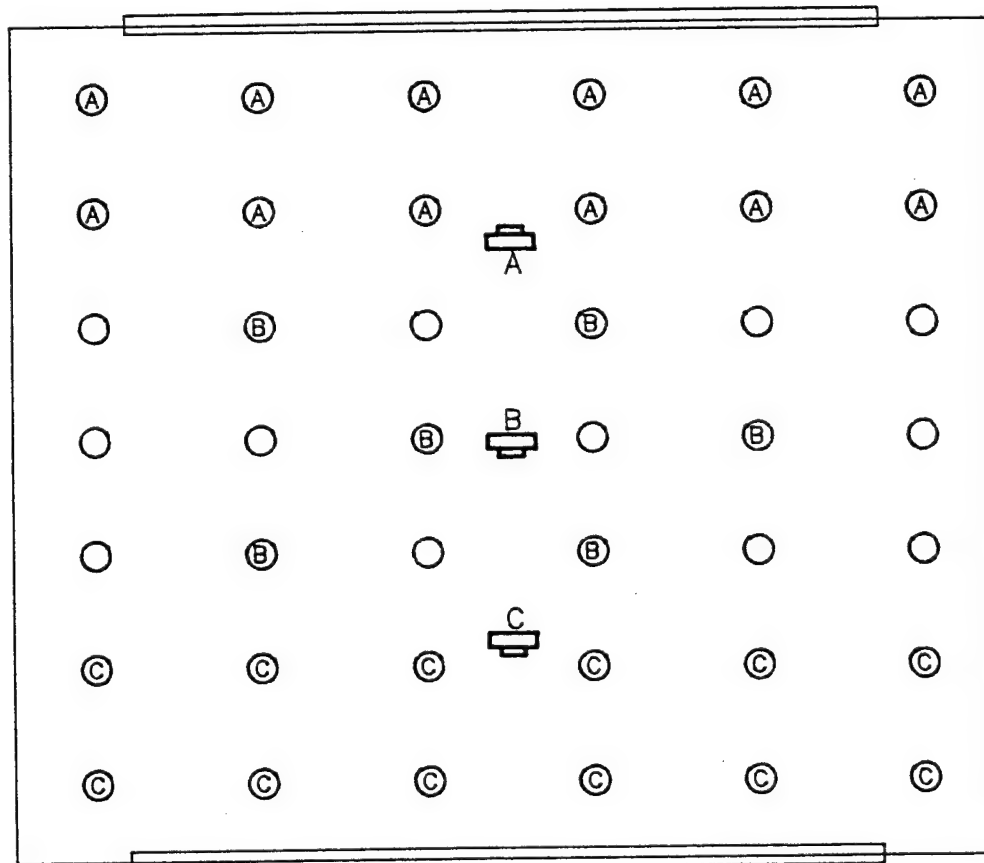
LEGEND	
SYMBOL	DESCRIPTION
○	LIGHT; CONTROLLED BY MANUAL SWITCH ONLY
Ⓐ	LIGHT; LETTER INSIDE DESIGNATES CONTROLLING PHOTOCELL
☐ A	PHOTOCELL; LETTER DESIGNATES WHICH PHOTOCELL
▬	BAY DOOR





# FIGURE 3.10 PHOTOCELL CONTROL LAYOUT - BUILDING 5222

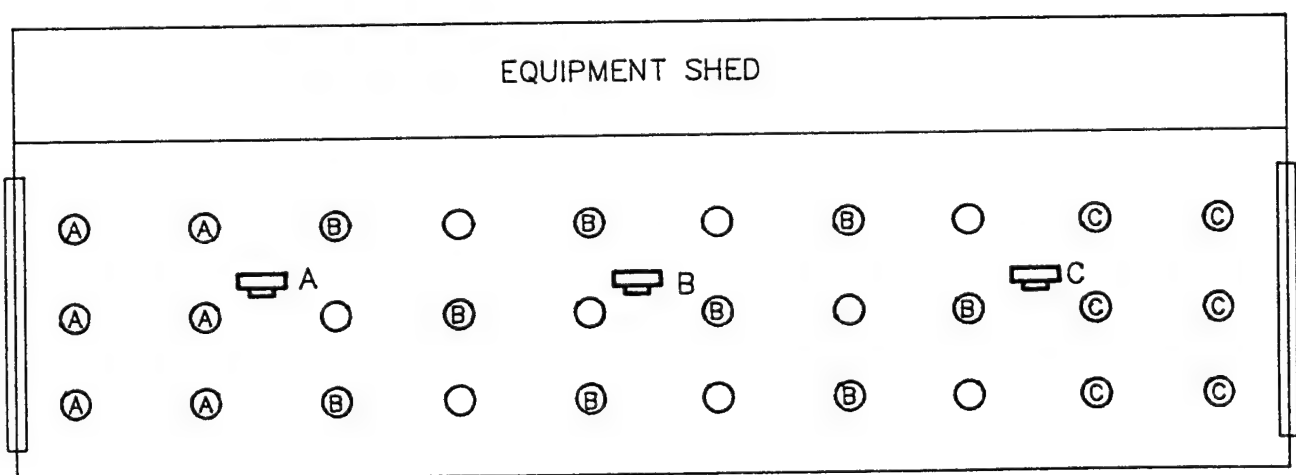
LEGEND	
SYMBOL	DESCRIPTION
○	LIGHT; CONTROLLED BY MANUAL SWITCH ONLY
Ⓐ	LIGHT; LETTER INSIDE DESIGNATES CONTROLLING PHOTOCELL
 A	PHOTOCELL; LETTER DESIGNATES WHICH PHOTOCELL
	BAY DOOR





# FIGURE 3.11 PHOTOCELL CONTROL LAYOUT - BUILDING 5253

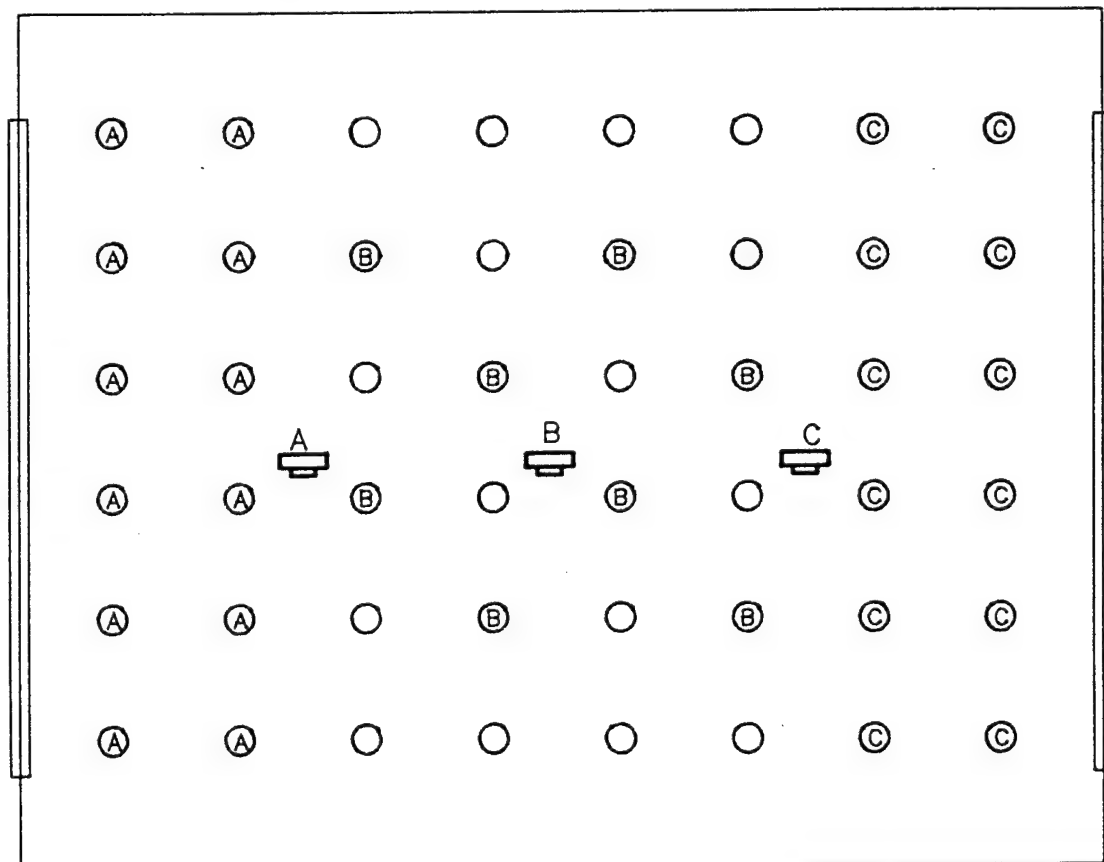
LEGEND	
SYMBOL	DESCRIPTION
○	LIGHT; CONTROLLED BY MANUAL SWITCH ONLY
Ⓐ	LIGHT; LETTER INSIDE DESIGNATES CONTROLLING PHOTOCELL
☐ A	PHOTOCELL; LETTER DESIGNATES WHICH PHOTOCELL
▬	BAY DOOR





# FIGURE 3.12 PHOTOCELL CONTROL LAYOUT - BUILDING 5256

LEGEND	
SYMBOL	DESCRIPTION
○	LIGHT; CONTROLLED BY MANUAL SWITCH ONLY
Ⓐ	LIGHT; LETTER INSIDE DESIGNATES CONTROLLING PHOTOCELL
☐ A	PHOTOCELL; LETTER DESIGNATES WHICH PHOTOCELL
▬	BAY DOOR





LOUISVILLE DISTRICT CORPS OF ENGINEERS  
ENGINEERING DIVISION, A/E MANAGEMENT BRANCH (CEORL-ED-M)

ANNEX A  
DETAILED SCOPE OF WORK  
FORT KNOX, KY (OPTION)  
May 10, 1993

1. Project Name & Location: Option- FY93Y Fort Knox Limited Energy Study (LES), Postwide Lighting Survey, Interior and Exterior for energy efficiency. The ECOs are as follows:

- Improve light reflection and dispersion with spray-applied acoustic insulation on the ceiling of existing buildings. See FIGURE A.4.1 for building listing.
- Improve lighting with energy efficiency lighting presently available on the market. See FIGURE A.4.1 for building listing, same as the previous ECO.
- Occupancy sensors, photocells, controls on lights in zones, and any smart control device for shut down when foot candle level above certain levels, and etc. See FIGURE A.4.1 for building listing, same as the two previous ECOs listed.
- Lighted baseball fields post-wide both to improved energy lighting efficiency, and for occupancy sensor or photocell control for shutdown when not used. See FIGURE A.4.2 for facility listing.

2. GENERAL SOW vs. DETAILED SOW: The General Scope of Work (GSOW) will apply to contract efforts as modified by the Detailed SOW. Should conflicts occur between the GSOW and the Detailed SOW, the Detailed SOW shall govern.

3. RESPECTIVE POC's for this study:

Louisville District COE- Charles Lockman/CEORL-ED-M  
(502) 582-6041, fax#6763

Fort Knox DEH- Gary Meredith/ATZK-EH-PS, Energy Officer  
(502) 624-8358, fax#3679

Architect/Engineer(A/E)-

4. SCOPE:

4.1 The A/E shall provide all work necessary to complete the Limited Energy Study as defined by the GSOW including the Annexes. Information and instructions contained within the DSOW are provided as a means for the A/E Project Manager to expand or modify the GSOW as may be needed to suit the study for the three project areas listed in 1. above. This LES is much more flexible than the standard EEAP study, and is meant to address specific opportunities, buildings or Systems that the installation feels have high potential for energy or dollar savings.

4.2 The study will analyze a lighting survey ECO's in Buildings as listed in Figures A-4.1 & 4.2, attached for the facilities use of material, utilities, and other components of the industrial operation, and determine any energy savings methods/recommendations for this study. This includes interview of personnel to gather data for quantities, and operational data. Alternate energy sources such as solar, wind, geothermal, will not be included.

4.3 The study will consider new designs etc. for energy trends that make these facilities more cost effective and energy saving.

4.4 If electrical metering is required for data, the A/E shall assist the DEH in arranging for the installation, however, existing data is available at the installation, through existing equipment data, and by other studies/surveys.



5. DETAILED REQUIREMENTS: All detail requirements selected at Fort Knox for the purpose of this study, shall specifically include the specific facilities listed in 1. above and projects identified by the DEH staff. In general the facilities and projects, when investigated relative to the ECO's shall consult the following for possible information already gathered prior to this study which may help in doing the study:

1. Basewide Energy Systems Plan, Exec. Summary, Vol. 4 & 5, dated 1982, by Black & Veatch.
2. Energy Awareness Program, Fort Knox, Jan 1992, by Systems Corp.
3. ESOS (Energy Saving Opportunity Survey), Nov. 1990, Vol. 1-4, by Systems Corp.

The contractor will review existing building drawings, survey and monitor existing lights, and analysis the listed ECO's, and analysis additional ECO's readily discovered during the field survey.

6. PERFORMANCE: The total time required for completion of the study and the performance of all work shall not be more than 120 calendar days from the NTP (Notice to Proceed) on the contract. If the study takes the A/E less time than scheduled to achieve, a shortened schedule for submittal and coordination of review and interim review meeting at the installation may be coordinated by the A/E with all parties involved in the review process. Figure A-6.1 is a schedule of pertinent events and milestone dates for acceptable performance of the study at Fort Knox. Changes or adjustments made to the SOW during the term of the project study shall be made by the COE.

7. SUBMITTALS: The A/E's Project Manager shall provide direct distribution of all required submittals and documents in the numbers as listed in Figure A-7.1.

8. GOVERNMENT-FURNISHED INFORMATION: The following list of reference documents will be furnished to the A/E:

- a. ETSS 1110-3-254, Use of Electric Power for Comfort Space Heating (if applicable), and 1110-3-282 Energy Conservation
- b. Energy Conservation Investment Program (ECIP) Guidance, dated 4 Nov 1992 and the latest revision with current energy prices and discount factors for life cycle cost analysis.
- c. TM 5-785, Engineering Weather Data.
- d. AR 5-4, Change No. 1, Department of the Army Productivity Improvement Program.
- e. AR 415-15, 1 Jan 84, Military Construction, Army (MCA) Program Development
- f. The latest MCP Index.
- g. Drawings at the DEH of each facility.
- h. Reports listed in ECO information listed above which will assist in the development of the study for each facility.

9. LCCID FROM BLAST: A computer program titled Life Cycle Costing in Design (LCCID) will be used and is available from the BLAST Support Office in Urbana, Illinois for a nominal fee. This computer program will be used for performing the economic calculations for ECIP and non-ECIP ECOs. The A/E is encouraged to obtain and use this computer program. The BLAST Support Office can be contacted at 144 Mechanical Engineering Building, 1206 West Green Street, Urbana, Illinois 61801. The telephone number is (217) 333-3977, or (800) 842-5478.



10. If it is possible that the buildings in this study will be subject to the computer modeling requirements of paragraph 2.6 of the CSOW, then the simulation programs acceptable to the office doing the technical review should be listed in the detailed scope of work. Some acceptable simulation programs follow:

- a. Building Loads and System Thermodynamics (BLAST) \*
- b. DOE 2.1B \*
- c. Carrier E20 or Hourly Analysis Program (HAP) \*\*
- d. Trane Air-Conditioning Economics (TRACE) \*\*

\* Very accurate, but requires a lot of time for input; therefore it is rather expensive for straightforward projects.

\*\* Adequate for load determination, equipment selection, and energy performance for most projects.



FIGURE A-4.1 BUILDINGS/FACILITIES, Fort Knox, KY to be studied under the ECOs listed in paragraph 1. (lighted baseball fields not included) are as follows:

Godman AAF area:

- 5220 ACM, 50,027 S.F., blt. 41
- 5232 ACM, 20,197 S.F., blt. 59
- 5253 ACM, 13,639 S.F., blt. 52
- 5222 ACM, 35,392 S.F., blt. 64
- 5252 ACA, 18,905 S.F., blt. 52
- 5256 ACM, 20,179 S.F., blt. 59

Armor Board Motor Pool area:

- 482 MOTP, 16,923 S.F., blt. 39
- 484 MOTP, 16,479 S.F., blt. 39
- 486 MOTP, 36,659 S.F., blt. 39
- 483 MOTP, 16,479 S.F., blt. 39
- 485 MOTP, 16,479 S.F., blt. 39
- 487 MOTP, 36,659 S.F., blt. 39

Facilities Engineer General area:

- 94 VMS, 30,894 S.F., blt. 41
- 73 FES, 13,580 S.F., blt. 42
- 92 VMS, 13,298 S.F., blt. 34

Transportation Motor Pool area:

- 158 VMS, 18,271 S.F., blt. 42
- 159 VMS, 20,833 S.F., blt. 42

St. Johns Tank Motor Park area:

- 2730 VMS, 26,985 S.F.

Boatwright Maintenance area: (adjacent to St. Johns)

- 2956 VMS, 4,810 S.F., blt. 53
- 2957 VMS, 5,449 S.F., blt. 53

St. Johns Tank Motor Park area continued:

- 2966 VMS 4,787 S.F., blt.
- 2965 VMS 4,787 S.F., blt.
- 2963 VMS, 7,220 S.F., blt. 69
- 2969 VMS, 7,421 S.F., blt. 56
- 2971 VMS, 6,900 S.F., blt. 56
- 2973 VMS, 6,900 S.F., blt. 56
- 2979 VMS, 6,900 S.F., blt. 56
- 2970 VMS, 7,421 S.F., blt. 56
- 2972 VMS, 6,900 S.F., blt. 56
- 2974 VMS, 6,900 S.F., blt. 56
- 2980 VMS, 6,900 S.F., blt. 56

194th Armored BDE Tactical Equipment Shops area:

- 2942 VMS, 17,220 S.F., blt. 82
- 2944 VMS, 21,840 S.F., blt. 82
- 2943 VMS, 17,220 S.F., blt. 82

Farmer Tank Motor Park area:

- 6564 VMS, 5,449 S.F., blt. 54
- 6563 VMS, 4,810 S.F., blt. 54
- 6561 VMS, 5,449 S.F., blt. 54
- 6560 VMS, 4,810 S.F., blt. 54
- 6562 VMS, 4,810 S.F., blt. 54

Facility that is across from Finney Sub-cab. Tank Range on Frazier Road area:

- 5901 VMS, 22,786 S.F., blt. 82

The Fms Co



FIGURE A.4.2. LIGHTED BASEBALL FIELDS, Fort Knox, KY. are as follows:

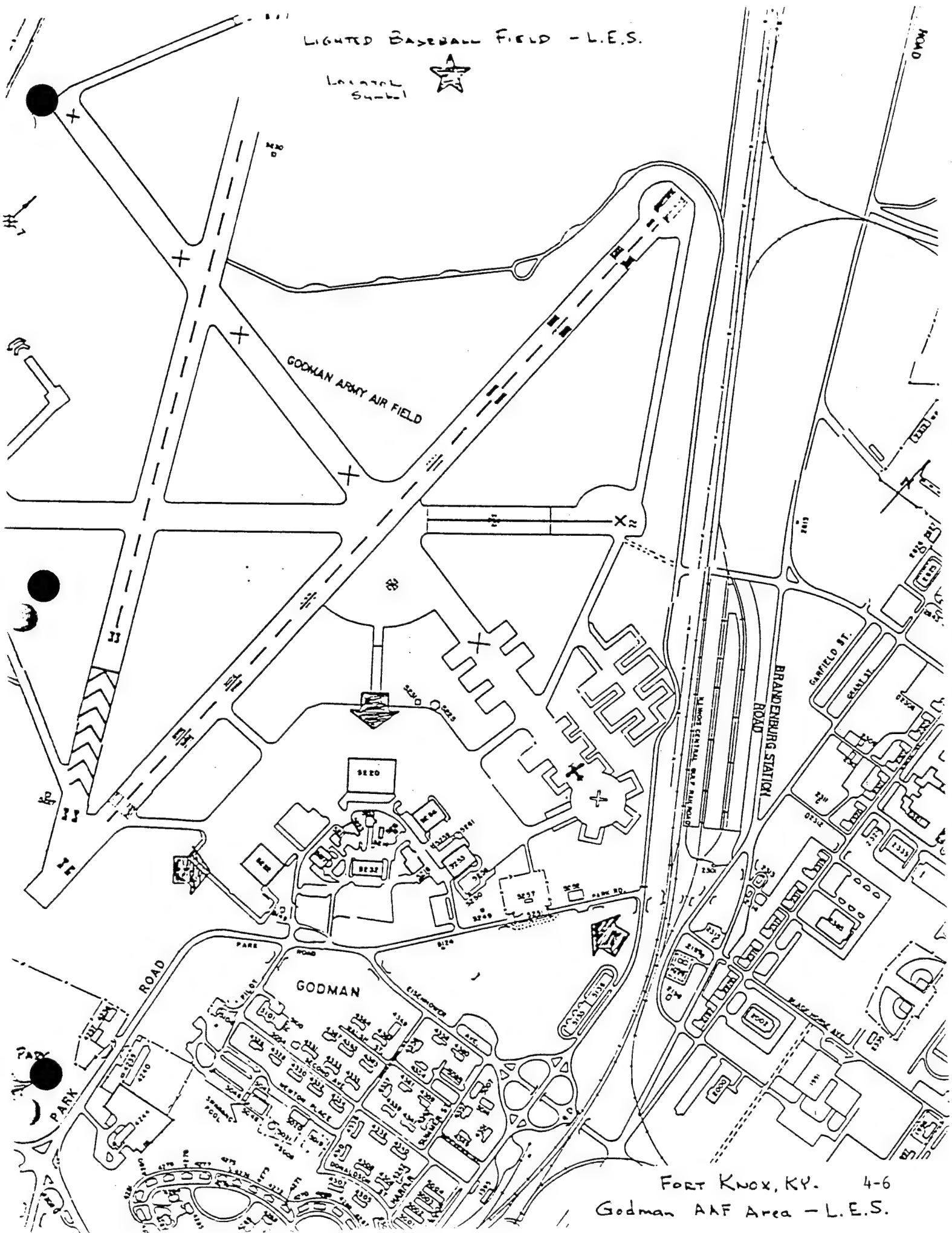
<u>facility no.</u>	<u>name</u>	<u>location/vicinity</u>
4557	Keys Park	Aububon Street/Dixie Hwy.
-6609	Turrett Field	Brule St./ North Huron St.
-2358	Gary Owens Regm't	Gary Owens Avenue
-6647	East-West	Eisenhower Ave./Huron Street
-5913	Disney Area	26th Calvery St. & Rineland St.
-6532		2nd Dragoons & Bachler
-2388A		Black Horse/Hell on Wheels
-2388S		Black Horse/Hell on Wheels

6532 - SOFTBALL FIELD  
 6609 - BASEBALL FIELD  
 6647 - SOFTBALL FIELD  
 2358 - " "  
 2388 - " "  
 4557 - BASEBALL FIELD



LIGHTED BASEBALL FIELD - L.E.S.

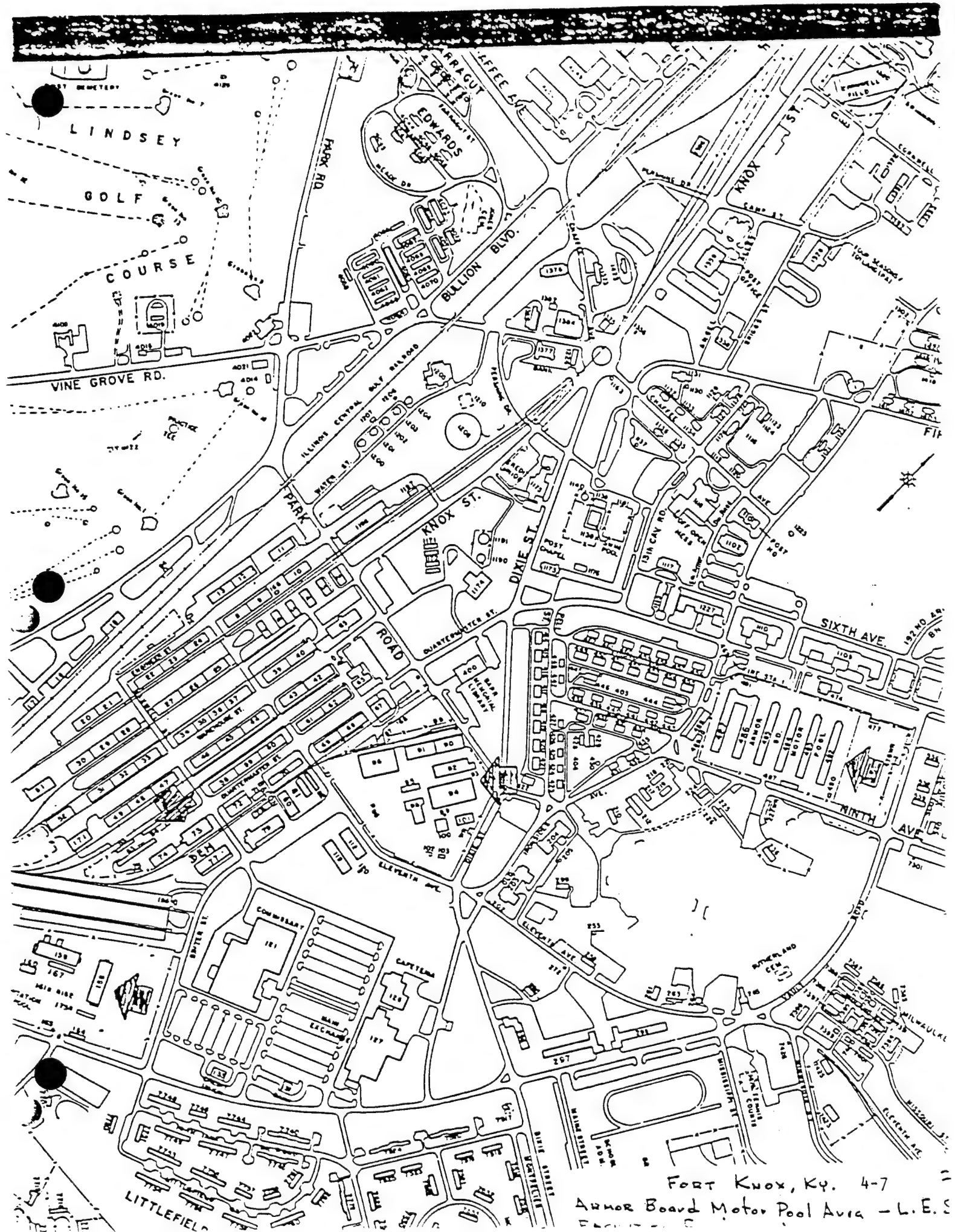
Location  
Symbol



FORT KNOX, KY. 4-6

Godman AAF Area - L.E.S.

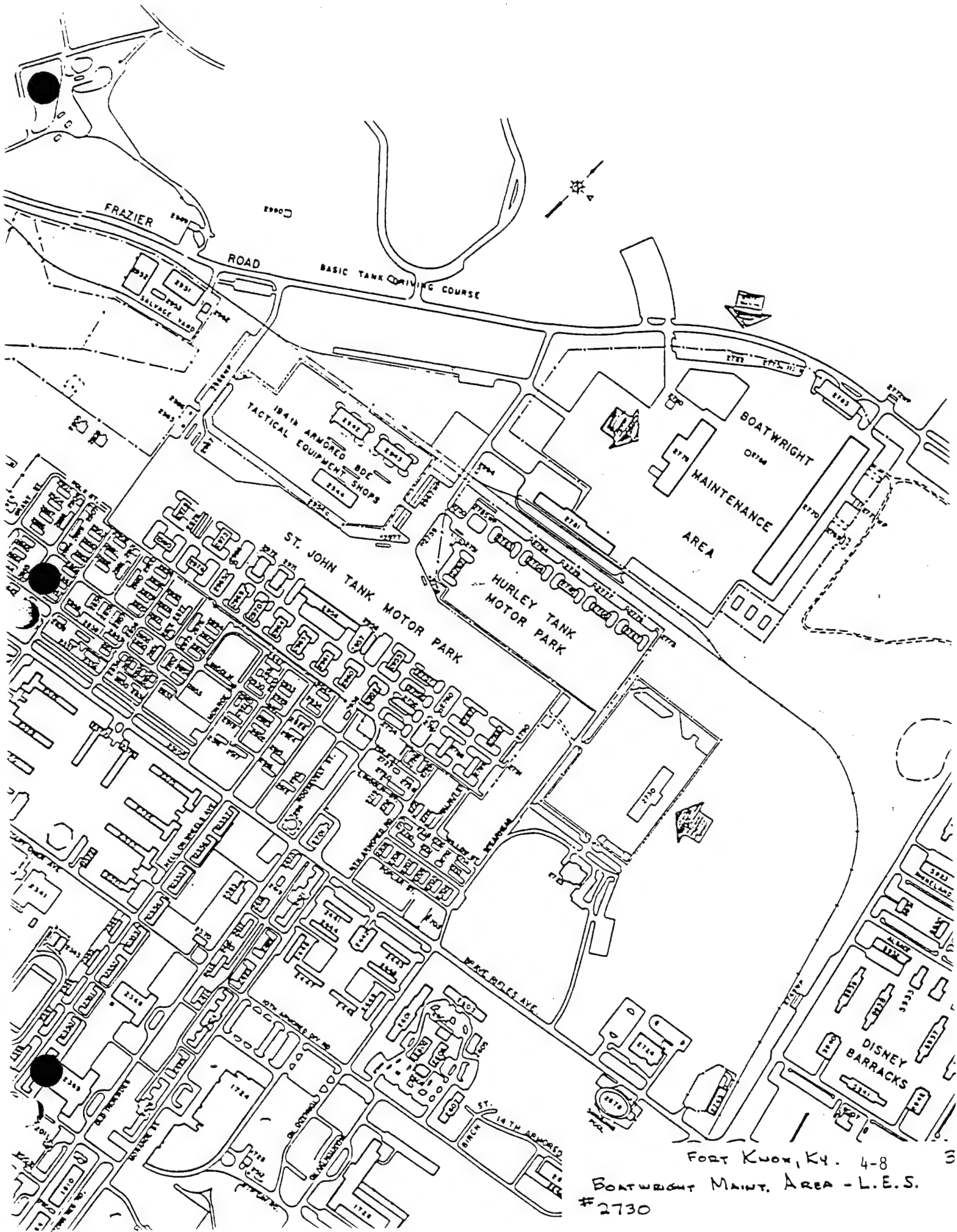




FORT KNOX, KY. 4-7

ARMOR BOARD MOTOR POOL AREA - L.E.S.





FORT KNOX, KY. 4-8  
BOATWRIGHT MAINT. AREA - L.E.S.  
#2730





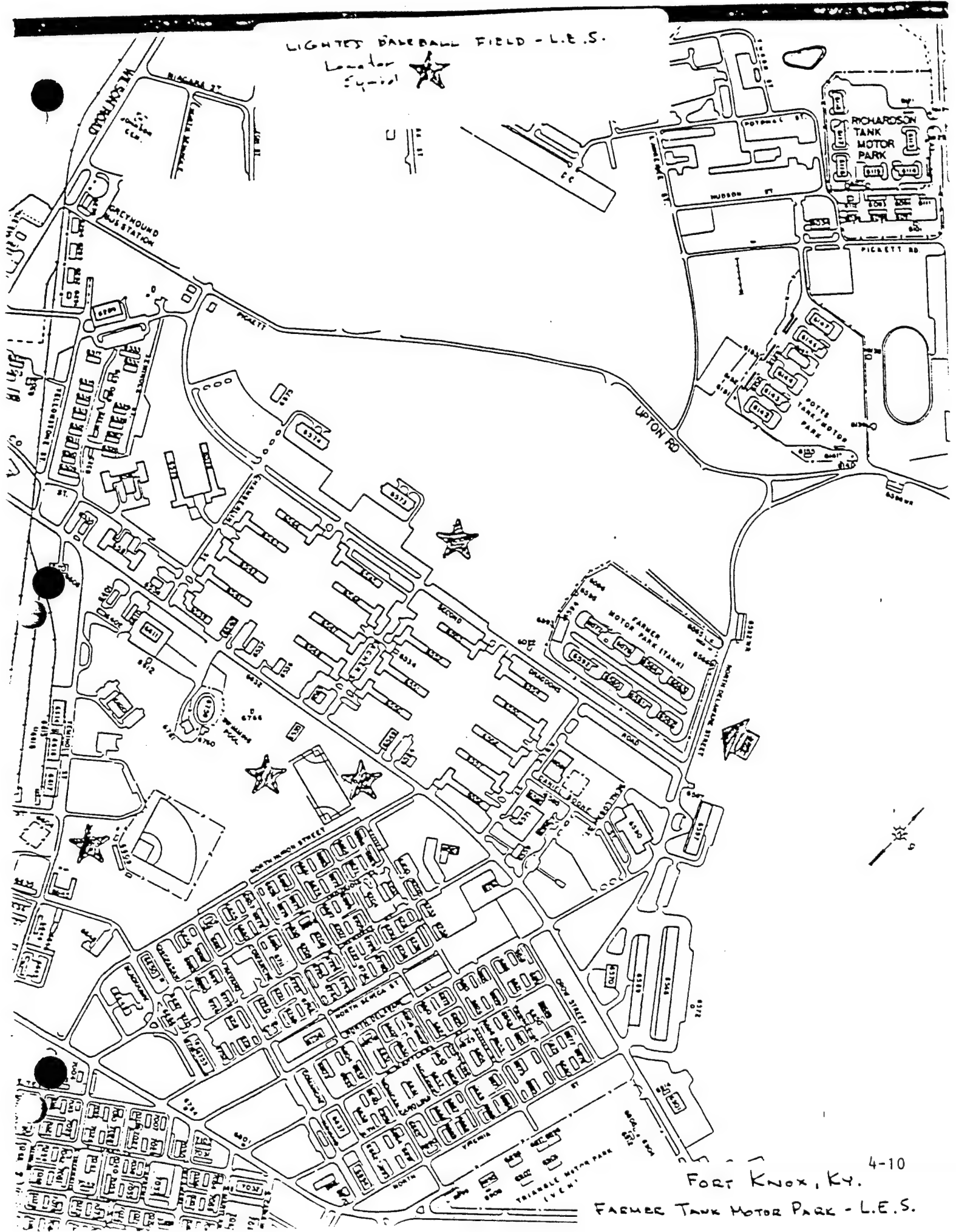
4-9

4-9



LIGHTS BASEBALL FIELD - L.E.S.

Location  
Symbol

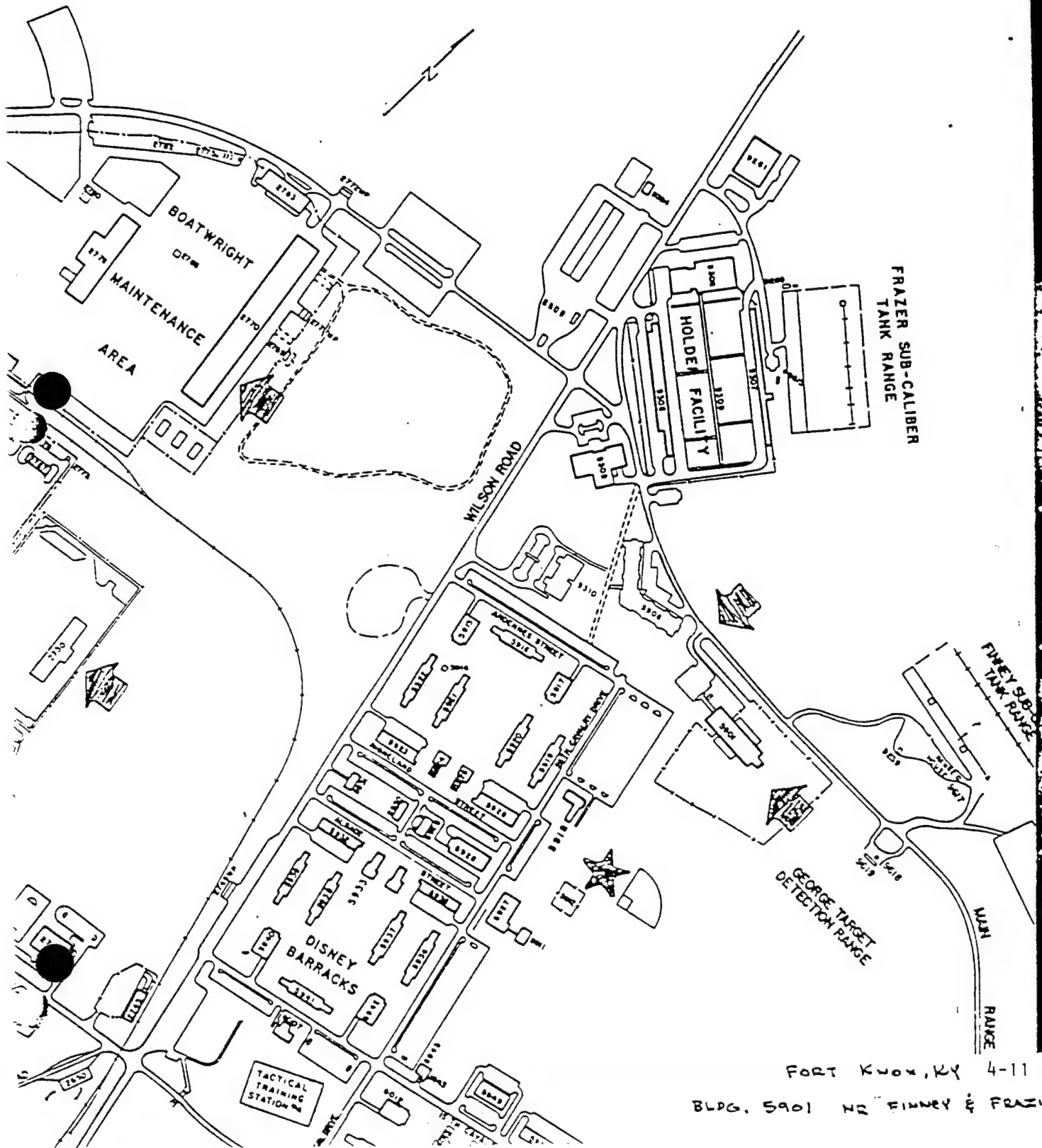


4-10  
FORT KNOX, KY.

FARMER TANK MOTOR PARK - L.E.S.



# LIGHTED BASEBALL FIELD - L.E.S.



FORT KNOX, KY 4-11

6

BLDG. 5901 N2 FINNEY & FRAZER-LE



FIGURE A-6.1. SCHEDULE for Option LES, FY93Y EEAP, Fort Knox (FK), KY., if awarded simultaneously w/contract: (SAF)

<u>Item</u>	<u>Calendar Days</u>	<u>Actual Date</u>
1. CBD ANNOUNCEMENT.....0	..	16 Mar 93
2. CBD CLOSED.....0	..	15 Apr 93
3. SOW APPROVED BY COE/DEH/MACOM.....0	..	15 Apr 93
4. PRESELECTION/SELECTION BOARD.....0	..	6/7 May 93
5. RFP LETTER TO A/E.....0	..	18 May 93
6. RFP LETTER RECEIVED BY A/E.....0 (COE, MACOM, DEH, and A/E coordinates date)	..	20 May 93
7. ENTRY INTERVIEW @ Fort Knox (FK).....0 (prior to Pre-SOW Mtg. DEH, COE, and A/E)	..	03 Jun 93
8. PRE-NEGOTIATION SCOPING MEETING @ FK.....0 (for RFP neg'ns, scoping w/DEH, COE, MACOM)	..	03 Jun 93
9. a A/E SUBMITS PROPOSAL/NEG'NS BEGIN.....0 b Negotiations begins/ends	..	10 Jun 93 14-18J 93
10. AWARDABILITY OF CONTRACT-START/NTP..... .. (field analysis begins by A/E, SAF)	..	28-30J 93
11. INTERIM SUBMITTAL @ 40%.....60 (all field work completed/ECO's analyzed)	..	01 Sep 93
12. REVIEW PERIOD OF THE INTERIM SUBMITTAL.....75 (COE gathers comments from IN-HOUSE/DEH/MACOM)	..	15 Sep 93
13. INTERIM REVIEW MEETING @ FK.....76 (COE, MACOM, DEH, A/E, & others)	..	21 Sep 93
14. EXIT INTERVIEW MTG. @ FK.....76	..	21 Sep 93
15. FINAL SUBMITTAL.....120 (A/E sends directly to as listed, herein)	..	01 Nov 93
16. DEH may require to have input on the .....175 DD Form 1391 from A/E	..	06 Dec 93

NOTE: Option, Phase II, if awarded separately, will follow 10. through 16. listed above for the schedule.



FIGURE A-7.1. Distribution of Submittals: The A/E shall make direct submittal and responses to comments as indicated by the following schedule:

Organization	Correspondence			
		Executive Summary		
		Reports	Summary	Fieldnotes

COMMANDER, US Army Engineer District, Louisville 1 1 3 1\*

ATTN: CEORL-ED-M/Charles Lockman  
P.O. Box 59  
Louisville, KY 40201-0059  
(tel. 502-582-6041, or fax# 6763, or 5281)

COMMANDER, US Army Armor Center & Fort Knox 1 1 1 1\*

ATTN: ATZK-EH-PS/Gary Meredith, Energy Officer  
Building #77  
Fort Knox, KY 40121-5000  
(tel. 502-624-8358, or fax# 3679)

HQ TRADOC (MACOM) 1 1 1 1\*

ATTN: ATBO-GFE/Al Betcher  
Fort Monroe, VA 23651-5000  
(tel. 804-727-2453, or fax# 2362)

COMMANDER, US Army Engineer District, Mobile 1 1\*\*0 0

ATTN: CESAM-EN-CC/Tony Battaglia (EEAP TCX)  
P.O. Box 2288  
Mobile, AL 36628-0001  
(tel. 205-690-2618, or fax# 2424)

COMMANDER, US Army Engineer Div., Ohio River 0 1\*\*0 0

ATTN: CEORD-DL-M/Joe Semrad  
P.O. Box 1159  
Cincinnati, OH 45201-1159  
(tel. 513-684-3975)

COMMANDER, US Army Corps of Engineers 0 1\*\*0 0

ATTN: CEMP-ET/Dan Gentil (EEAP Mgr.)  
20 Massachusetts Avenue  
Washington, D.C. 20314-1000  
(tel. 202-272-0430)

COMMANDER, US Army Logistics Evaluation Agency 0 1\*\*0 0

ATTN: LOEA-PL/Mr. Keath  
New Cumberland Army Depot  
New Cumberland, Pa. 17070-5006

\* Field Notes submitted in final at Interim submittal.  
\*\* Submit copies of the final Executive Summary Only



## ANNEX B

### EXECUTIVE SUMMARY GUIDELINE

1. Introduction.
2. Building Data (types, number of similar buildings, sizes, etc.)
3. Present Energy Consumption of Buildings or Systems Studied.
  - o Total Annual Energy Used.
  - o Source Energy Consumption.
    - Electricity - KWH, Dollars, BTU
    - Fuel Oil - GALS, Dollars, BTU
    - Natural Gas - THERMS, Dollars, BTU
    - Propane - GALS, Dollars, BTU
    - Other - QTY, Dollars, BTU
4. Reevaluated Projects Results.
5. Energy Conservation Analysis.
  - o ECOs Investigated.
  - o ECOs Recommended.
  - o ECOs Rejected. (Provide economics or reasons).
  - o ECIP Projects Developed. (Provide list)\*
  - o Non-ECIP Projects Developed. (Provide list)\*
  - o Operational or Policy Change Recommendations.

\* Include the following data from the life cycle cost analysis summary sheet: the cost (construction plus SIOH), the annual energy savings (type and amount), the annual dollar savings, the SIR, the simple payback period and the analysis date.
6. Energy and Cost Savings.
  - o Total Potential Energy and Cost Savings.
  - o Percentage of Energy Conserved.
  - o Energy Use and Cost Before and After the Energy Conservation Opportunities are Implemented.



ANNEX C

REQUIRED DD FORM 1391 DATA

To facilitate ECIP project approval, the following supplemental data shall be provided:

- a. In title block clearly identify projects as "ECIP."
- b. Complete description of each item of work to be accomplished including quantity, square footage, etc.
- c. A comprehensive list of buildings, zones, or areas including building numbers, square foot floor area, designated temporary or permanent, and usage (administration, patient treatment, etc.).
- d. List references, and assumptions, and provide calculations to support dollar and energy savings, and indicate any added costs.
  - (1) If a specific building, zone, or area is used for sample calculations, identify building, zone or area, category, orientation, square footage, floor area, window and wall area for each exposure.
  - (2) Identify weather data source.
  - (3) Identify infiltration assumptions before and after improvements.
  - (4) Include source of expertise and demonstrate savings claimed. Identify any special or critical environmental conditions such as pressure relationships, exhaust or outside air quantities, temperatures, humidity, etc.
- e. Claims for boiler efficiency improvements must identify data to support present properly adjusted boiler operation and future expected efficiency. If full replacement of boilers is indicated, explain rejection of alternatives such as replace burners, nonfunctioning controls, etc. Assessment of the complete existing installation is required to make accurate determinations of required retrofit actions.
- f. Lighting retrofit projects must identify number and type of fixtures, and wattage of each fixture being deleted and installed. New lighting shall be only of the level to meet current criteria. Lamp changes in existing fixtures is not considered an ECIP type project.
- g. An ECIP life cycle cost analysis summary sheet as shown in the ECIP Guidance shall be provided for the complete project and for each discrete part included in the project. The SIR is applicable to all segments of the project. Supporting documentation consisting of basic engineering and economic calculations showing how savings were determined shall be included.
- h. The DD Form 1391 face sheet shall include, for the complete project, the annual dollar and MBTU savings, SIR, simple amortization period and a statement attesting that all buildings and retrofit actions will be in active use throughout the amortization period.
- i. The calendar year in which the cost was calculated shall be clearly shown on the DD Form 1391.
- j. For each temporary building included in a project, separate documentation is required showing (1) a minimum 10-year continuing need, based on the installation's annual real property utilization survey, for active building retention after



retrofit, (2) the specific retrofit action applicable and (3) an economic analysis supporting the specific retrofit.

k. Nonappropriated funded facilities will not be included in an ECIP project without an accompanying statement certifying that utility costs are not reimbursable.

l. Any requirements required by ECIP guidance dated 4 Nov 1992 and any revisions thereto. Note that unescalated costs/savings are to be used in the economic analyses.

m. The five digit category number for all ECIP projects except for Family Housing is 80000. The category code number for Family Housing projects is 71100.



# GLOSSARY OF ACRONYMS

A/E	Architect Engineer
AR	Army Regulation
B/C	Benefit to Cost
COE	Corps of Engineers
CWE	Current Working Estimate
DEH	Director of Engineering and Housing
DOD	Department of Defense
DSOW	Detailed Scope of Work
E/C	Energy to Cost
ECAM	Energy Conservation and Management
ECIP	Energy Conservation Investment Program
ECO	Energy Conservation Opportunity
EEAP	Energy Engineering Analysis Program
EHSC	Engineering and Housing Support
EMCS	Energy Monitoring Analysis Program
ESOS	Energy Savings Opportunity Survey
GSOW	General Scope of Work
HQUSACE	Headquarters US Army Corps of Engineers
LCCA	Life Cycle Cost Analysis
LCCID	Life Cycle Cost In Design
MACOM	Major Army Command
MCA	Military Construction Army
NECPA	National Energy Conservation Policy Act
OSD PIF	OSD Productivity Capital Investment Funding
PCIP	Productivity Capital Investment Program
PDB	Project Document Brochure
PECIP	Productivity Enhancing Capital Investment Program
POC	Point of Contact
QRIP	Quick Return on Investment Program
SIR	Savings Investment Ratios
TCX	Technical Center of Expertise



# SYSTEMS<sub>corp</sub>

SYSTEMS ENGINEERING AND MANAGEMENT CORPORATION

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October 19, 1993

Commander, US Army Engineer District, Louisville  
ATTN: CEORL-ED-M/Charles Lockman  
P. O. Box 59  
Louisville, KY 40201-0059

Dear Mr. Lockman:

RE: FY93 Fort Knox Limited Energy Study  
Contract No. DACA27-93-0086

The following is a list of the topics discussed and decisions reached during the Interim Review meeting at Fort Knox on 13 October 1993:

Wednesday, 13 October 1993

**Persons Present:**

Charles Lockman	Louisville Corp. of Engineers
Gary Meredith	Fort Knox DPW Energy Officer
Paul Frye, Jr.	Fort Knox DPW ATZK-PWP
Kevin Addison	Fort Knox DPW Energy Office
Julie Hollensbe	Systems Corp Program Manager
Keith Derrington	Systems Corp Vice President

The Interim Review meeting began around 8:30 a.m. with all the listed attendees. Systems Corp representative Julie Hollensbe presented an overview of the progress to date for the Limited Energy Study. The presentation discussed how each ECO was evaluated and the results achieved.

Project groupings were discussed for the Final submittal. High Efficiency Indoor Lighting, Indoor Lighting Controls and Ballfield Lighting and Controls, ECO's 2, 3.1, 4.1 and 4.2 respectively, will be grouped as one project. ECO-1, Ceiling Reflectance, will not be included in the project group due to the long payback. ECO-3.2, Indoor Dimming and Photocell Control will not be included in the project group due to the project cost and ECO-3.1 appears to be a more attractive alternative.



Charles Lockman  
Page 2  
October 19, 1993

It was agreed to add Buildings 2770 and 2778 to the Final submittal. High efficiency lighting and lighting controls, ECO's 2 and 3.1, will be evaluated for these facilities. Fort Knox supplied Systems Corp with the necessary information for these two facilities.

Questions regarding the 1990 Energy Savings Opportunity Survey for Fort Knox was discussed. Kevin Addison has found some missing ECO Sections from the Interim Submittal. Systems Corp agreed to supply Fort Knox with an additional copy of the information.

The Interim Review meeting was concluded around 11:00 a.m.

Attached are the responses to the Interim Review Comments.

If you have any questions or comments regarding this material, please do not hesitate to contact me at (615) 521-6536.

Sincerely,

SYSTEMS CORP



Julie Hollensbe, E.I.T.

Enclosure: Interim Review Comments and Responses

cc: Gary Meredith, ATZK-EH-PS  
Al Betcher, ATBO-GFE  
Tony Battaglia, CESAM-EN-CC



LIMITED ENERGY STUDY  
FORT KNOX, KENTUCKY

INTERIM REVIEW COMMENTS AND RESPONSES

REVIEWER: CHARLES LOCKMAN, LOUISVILLE DISTRICT CORP OF ENGINEERS

**Comment No. 1 (from Bonn, E.E.) :**

"We agree with the basic methodology used in determining ECO savings. However, the operating times (ECO-3 and ECO-4) assumed in determining these savings must be shown to be agreeable with the users before it can be determined that these ECO's are feasible. As an example, we cannot determine lighting at the ballfields and, therefore, whether or not the proposed operating scheme will be acceptable."

**Response:**

Due to the large number of users the ballfields have throughout a given year, It would be impossible to determine the exact operating hours of the lighting systems. The approximate operating hours for the ballfields were agreed to by Systems Corp and the Fort Knox Energy Office.

The operating hours used for ECO-3 were collected from the actual users in the building.

**Comment No. 2 (from Bonn E.E.) :**

"10 year period of economic analysis used in the study (Part 9) does not agree with the recommended 15 year period in the Energy Conservation Investment Program Guidance."

**Response:**

The Life Cycle Cost analyses were performed using a 15 year economic life for all the lighting systems. There were some errors in the report by referring to a 10 year economic life. The corrections to the report will be made in the Final submittal.

**Comment No. 3 (General):**

"Received LES at Fort Knox on 04 October 1993, well in advance of the schedule date to submit."

**Response:**

No response required.

**Comment No. 4 (General):**

No further comments. We think this is a good study for the installation.

**Response:**

No response required.



REVIEWER: GARY MEREDITH, FORT KNOX ENERGY OFFICER

**Comment No. 1 (General) :**

Fort Knox would like to have Buildings 2770 and 2778 included in the Final submittal.

**Response:**

Systems Corp agrees to include these two additional buildings. The required field survey information was supplied by the Fort Knox Energy Office.

**Comment No. 2 (General) :**

Suggestion on the numbering systems of the energy study binders to clarify that all pieces of the study are needed. Number volumes in order. Example: Fort Knox has received Volumes 1,2 & 3. Next, we should receive volumes 4,5,6..... (Final Report).

**Response:**

To minimize confusion, the Final submittal volume numbers will begin with no.1. It will need to be noted by Fort Knox that some individual building information will be found in only the Interim submittal. Charles Lockman, Louisville Corp of Engineers, concurs with this response to the above comment.

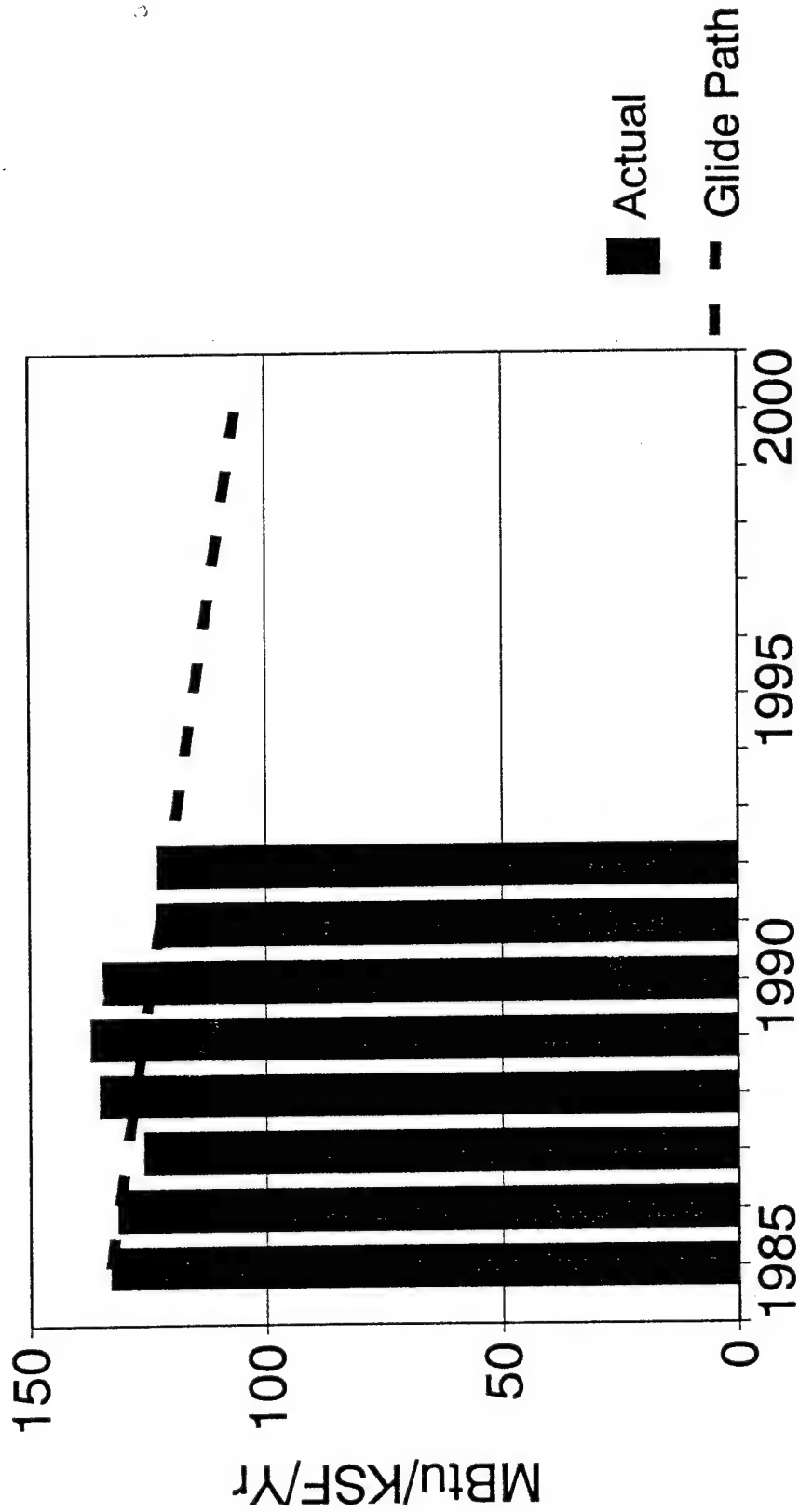


# LIMITED ENERGY STUDY

## Fort Knox, Kentucky



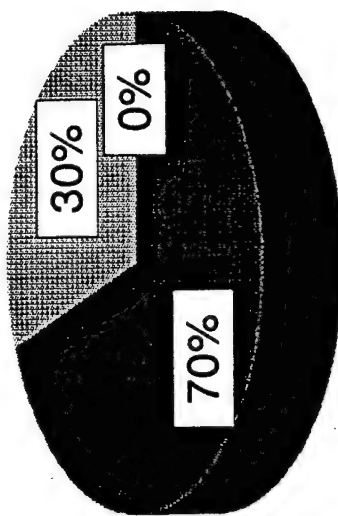
# Fort Knox Energy Consumption



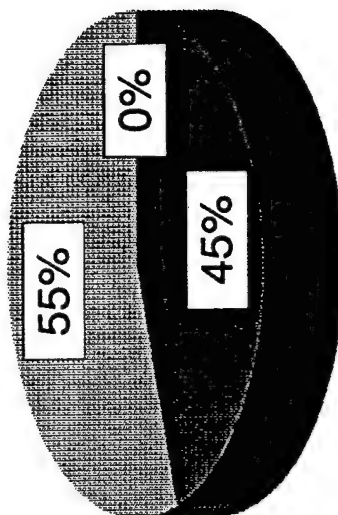


# Fort Knox Energy Consumption

FY92



2,107,770 MBtu



\$13,165,669

■ Electricity   ■ Natural Gas   ■ Other



# FORT KNOX ENERGY COSTS

Electric	
<i>Energy</i>	\$7.34/MBtu
<i>with Demand</i>	\$10.82/MBtu
Natural Gas	\$3.74/MBtu



# FORT KNOX FIELD SURVEY

- Conducted June 28 - July 2, 1993
- 35 Buildings Surveyed
- 8 Ballfields Surveyed



# WORK ACCOMPLISHED TO DATE

1. Field Surveys Completed for 35 Buildings
2. Lighting Surveys for 8 Ballfields
3. Baseline Energy Models
4. Evaluation of 64 Energy Conservation Opportunities
5. Calculations and Reporting of Solid Energy Conservation Opportunities for Possible Implementation
6. Preparation and Completion of all Field Notes
7. Completion of Interim Reports



# ENERGY CONSERVATION OPPORTUNITIES

- ECO-1: Ceiling Reflectance
- ECO-2: High Efficiency Indoor Lighting
- ECO-3: Indoor Lighting Controls
- ECO-4: Ballfield Lighting and Controls



## ECO-1: Ceiling Reflectance

- 14 Buildings Surveyed



# ECO-1: Information Collected

1. Building Dimensions
2. Type of Heating System
3. Current Building Condition



## ECO-1: Example Building

Building Number	T58
Energy Savings	103 MBtu/yr
Cost Savings	\$388/yr
Investment	\$19,000
SPB	48.9 yrs



## ECO-2: High Efficiency Indoor Lighting

- 14 Buildings Surveyed



## ECO-2: Information Collected

1. Building Hours of Use
2. Existing Fixture Type
3. Ballast Wattage
4. Lamp Wattage
5. Number of Fixtures



## ECO-2: Analysis Summary

Energy Savings	894 MBtu/yr
Cost Savings	\$18,410/yr
Investment	\$154,967
SIR	1.35
SPB	8.42 yrs



## ECO-3: Indoor Lighting Controls

- 21 Buildings Surveyed



## ECO-3: Information Collected

1. Building Hours of Use
2. Lamp Wattage
3. Ballast Wattage
4. Light Levels with and without Lights On
5. Number of Fixtures
6. Current Controls



## ECO-3: Replacement Options

ECO-3.1 On/Off Photo Cell Control

ECO-3.2 Dimming and On/Off Photocell Control



## ECO-3.1: Analysis Summary

Energy Savings	1516 MBtu/yr
Cost Savings	\$26,054/yr
Investment	\$94,342
SIR	3.15
SPB	3.62 yrs



## ECO-3.2: Analysis Summary

Energy Savings	1039 MBtu/yr
Cost Savings	\$16,173/yr
Investment	\$67,029
SIR	2.76
SPB	4.14 yrs



## ECO-4: Ballfield Lighting & Controls

- 8 Ballfields Surveyed



## ECO-4: Information Collected

1. Estimated Hours of Use
2. Lamp Wattage
3. Ballast Wattage
4. Fixture Type
5. Number of Fixtures
6. Light Level Readings
7. Ballfield Dimensions
8. Current Controls



## ECO-4: Replacement Options

ECO-4.1 High Efficiency Lighting

ECO-4.2 On/Off Photocell and 4-Hour Timer Control



## ECO-4.1: Analysis Summary

Energy Savings	325 MBtu/yr
Cost Savings	\$3312/yr
Investment	\$15,090
SIR	2.54
SPB	4.56 yrs



## ECO-4.2: Analysis Summary

Energy Savings	160 MBtu/yr
Cost Savings	\$1177/yr
Investment	\$5032
SIR	2.75
SPB	4.28 yrs

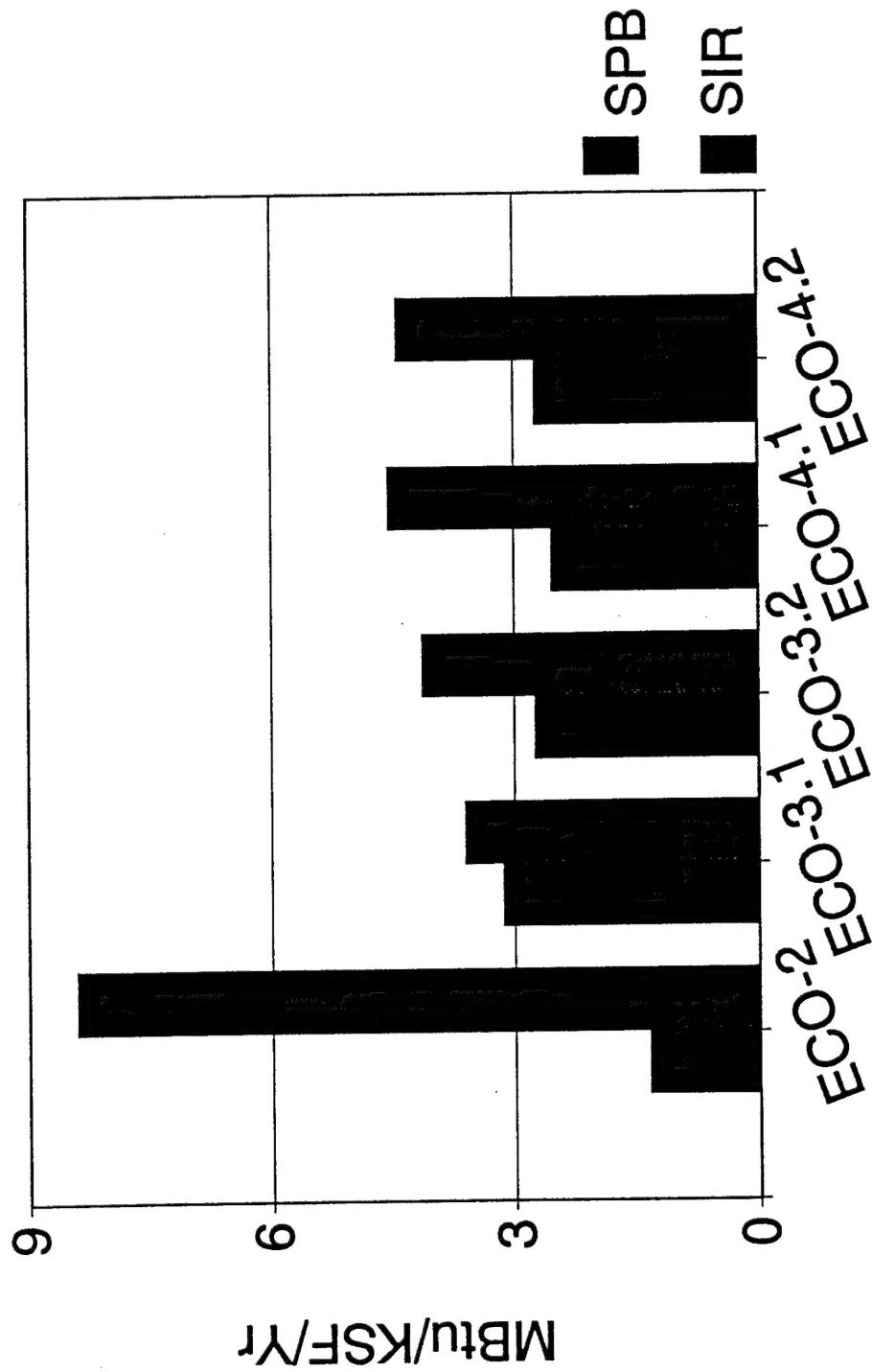


## Fort Knox ECO Comparison Investment Costs

ECO-2	\$154,967
ECO-3.1	\$94,342
ECO-3.2	\$67,029
ECO-4.1	\$15,090
ECO-4.2	\$5,032



# Fort Knox ECO Comparison SIR and SPB





## Fort Knox Suggested Project (\*)

Energy Savings	2895
Cost Savings	\$48,953
Investment	\$269,431
SIR	2.17
SPB	5.25

\* ECO 2, 3.1, 4.1, & 4.2



# REMAINING PHASES

- Response to Interim Review Comments
- Preparation of Programming and Implementation Documents
- Final Report